Engineering Library

In This Issue—*The Indianapolis Race*

JUN 4 1921

MOTOR AGE

Vol. XXXIX
Number 22

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, JUNE 2, 1921

Thirty-five Cents a Copy
Three Dollars a Year

What Proves an Essex Franchise Like Its Profits?

And With Their Prosperity Essex Dealers Are Assured of Permanency.

Profits, plus the knowledge of permanency, and the growth that friendly owners assure, are the basis of ail value in a dealer franchise.

In the business by which they live and express their usefulness, men want security. And recent months have given automobile dealers a lively consciousness of the value of connecting with a strongly founded line.

There is no indiscriminate demand for automobiles.

To succeed in today's selective market, dealers also must be selective. And nothing is such a sure guide in choosing a winning line as the satisfaction of owners.

You have a largely ready-made market in handling the Essex. The enthusiasm of its more than 50,000 owners is not only the pledge of repeat sales, but it exerts a convincing force in bringing new sales to Essex.

The business success of Essex dealers is visible. There is nothing problematical about it. Prosperity is reflected in their salesrooms. It is reflected in their financial status in any community.

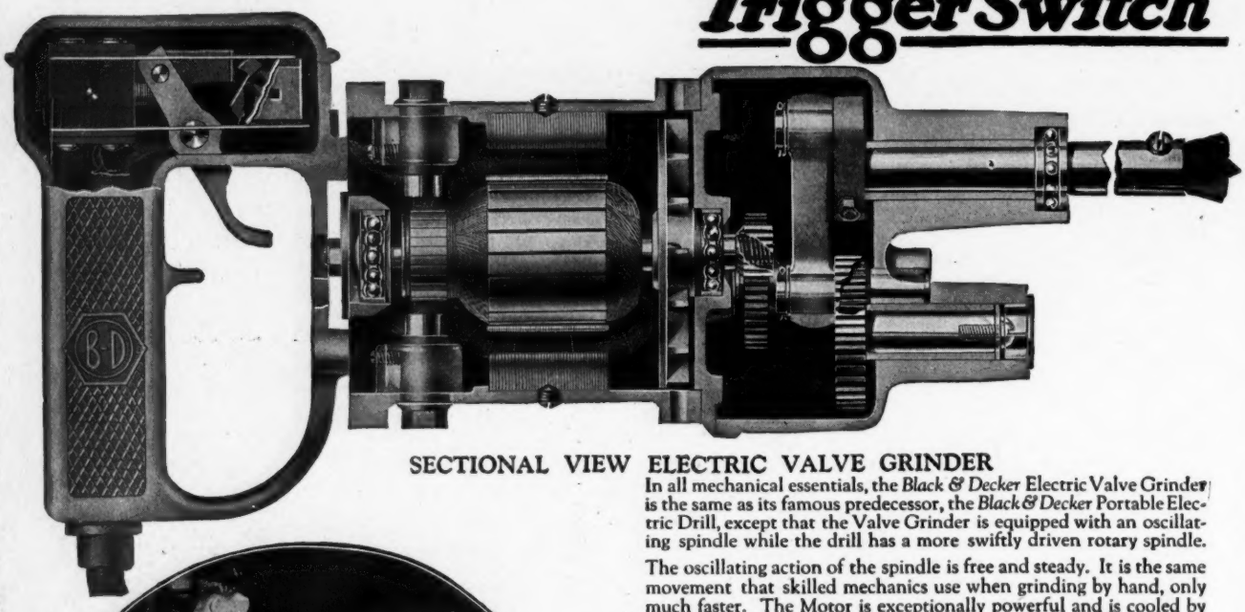
With equal opportunity do you think you could develop an automobile selling business, comparable to theirs?

If so, there is an opportunity for you to secure an Essex franchise. Write today.

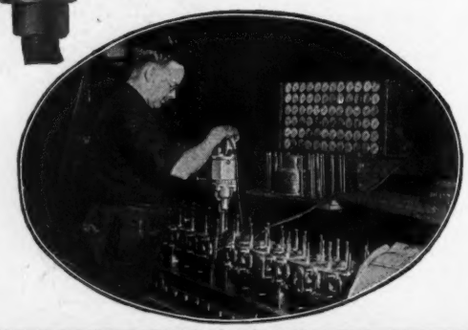
ESSEX MOTORS DETROIT USA

Entered as second class matter Sept. 19, 1899, at the post office at Chicago, Ill., under Act of March 6, 1879.

"With the Pistol Grip and Trigger Switch"



SECTIONAL VIEW ELECTRIC VALVE GRINDER



In all mechanical essentials, the *Black & Decker* Electric Valve Grinder is the same as its famous predecessor, the *Black & Decker* Portable Electric Drill, except that the Valve Grinder is equipped with an oscillating spindle while the drill has a more swiftly driven rotary spindle.

The oscillating action of the spindle is free and steady. It is the same movement that skilled mechanics use when grinding by hand, only much faster. The Motor is exceptionally powerful and is cooled by means of a centrifugal fan on the armature shaft. This fan forces air all around the armature bearings and motor windings. This insures a cool running motor which is of vital importance for any portable electric driven tool and upon which depends the life of the tool.

Ball bearings on each end of the armature shaft insure a free running motor and there is a Ball Thrust bearing on the spindle. Gears are cut from high carbon steel and are mounted on shafts ground to size, running in phosphor bronze bearings.

Equipment includes 15 feet duplex cable, set of detachable bits, lift spring and box grinding compound.

Price for 110 volts . . $61.60
Price for 220 or 32 volts 66.00

BLACK & DECKER

Electric Valve Grinders
Portable Electric Drills

Used wherever electricity is available. Operate on standard electric light circuits or farm lighting circuits.

In ordering merely specify whether 110, 220 or 32 volt machine is desired. It makes no difference whether current is direct or alternating. They run on either.

Sold by the leading Machinery, Mill Supply, Electrical, Hardware and Automotive Supply Houses.

Upon request we will gladly send you complete catalogue describing our line of Portable Electric Drills, Electric Valve Grinders and Electric Air Compressors.

THE BLACK & DECKER MFG. CO.

General Offices and Plant

600 EAST PENNSYLVANIA AVENUE

TOWSON HEIGHTS, BALTIMORE, MD., U.S.A.

Boston, 60 Massachusetts Ave. | New York, 181 Broadway | Philadelphia, 918 N. Broad St. | San Francisco, 270 Fremont St. | Pittsburgh, 1930 Penn Ave. | Chicago, 1908 Michigan Ave. | Cleveland, 2300 Chester Ave. | Detroit, 9 Selden Ave.

MOTOR AGE

Published Every Thursday by

THE CLASS JOURNAL COMPANY

MALLERS BUILDING

59 East Madison Street, CHICAGO

HORACE M. SWETLAND, *Pres.* W. I. RALPH, *Vice-Pres.*
E. M. COREY, *Treas.* A. B. SWETLAND, *Gen. Mgr.*

Member Audit Bureau of Circulations; Member Assoc. Business Papers, Inc.

Vol. XXXIX June 2, 1921 No. 22

CONTENTS

American Cars Dominate 500-Mile Race 7

A Word Picture of the Big Race 10

Service Lessons From the Pits 14

What the Artist Saw at Indianapolis 17

Practical Tire Merchandising and Repairing 18

Methods of Paying Salesmen

News of the Industry ..... 21 to 31

How the Electric System Works 32

Article VIII

DEPARTMENTS

Better Business 34

Automotive Architecture 36

The Readers' Clearing House 38

The Accessory Show Case 44

Service Equipment 45

The Automotive Repair Shop 46

Law in Your Business 47

Weekly Wiring Chart 48

Passenger Car Serial Number 49

Specifications of Passenger Cars, Trucks and Tractors 50

Coming Motor Events 54

Index to Advertisements Next to Last Page

MOTOR AGE

MALLERS BUILDING
CHICAGO

Phone Randolph 6960
Cable Address "Motage"

E. E. HAIGHT, Manager
DAVID BEECROFT, Directing Editor
RAY W. SHERMAN, Executive Editor B. M. IKERT, Editor

BRANCH OFFICES

DETROIT, 317 Fort St., W., Phone Maine 1351; CLEVELAND, 536-540 Guardian Bldg., Main 6432; NEW YORK CITY, U. P. C. Bldg., 239 W. 39th St., Phone Bryant 8760; PHILADELPHIA, Widener Bldg., Phone Locust 5189; BOSTON, 185 Devonshire St. Phone 4336 Ft. Hill.

SUBSCRIPTION RATES

United States, Mexico and U. S. Possessions	$ 3.00 per year
Canada	5.00 per year
All Other Countries in Postal Union	6.00 per year
Single Copies	35 cents

Make Checks Payable to Motor Age

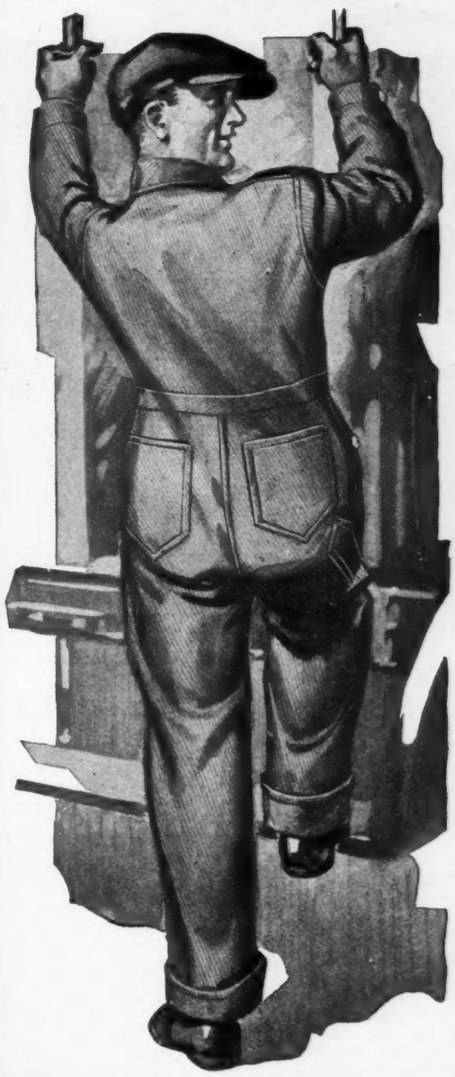
Entered as second-class matter, September 19, 1899, at the Post Office, Chicago, Illinois, under Act of March 3, 1879.

Owned by UNITED PUBLISHERS CORPORATION, 239 W. 39th St., New York, H. M. Swetland, Pres.; Charles S. Phillips, Vice-Pres.; A. C. Pearson, Treas.; Fritz J. Frank, Sec.

Outerall

REG. U.S. PATENT OFFICE

"The Economy Garment"



Outeralls Stand Gruelling Wear

Why is the Outerall so generally demanded by mechanics and truck men? Because under severe wearing tests it has proved to give the longest service. Because its special features of design such as extra yardage in sleeve and back make it the most practical and comfortable motor garment. Because the value in the Outerall is greatest, due to unequalled production in eight factories. Convince yourself by examining samples gladly supplied by the nearest branch.

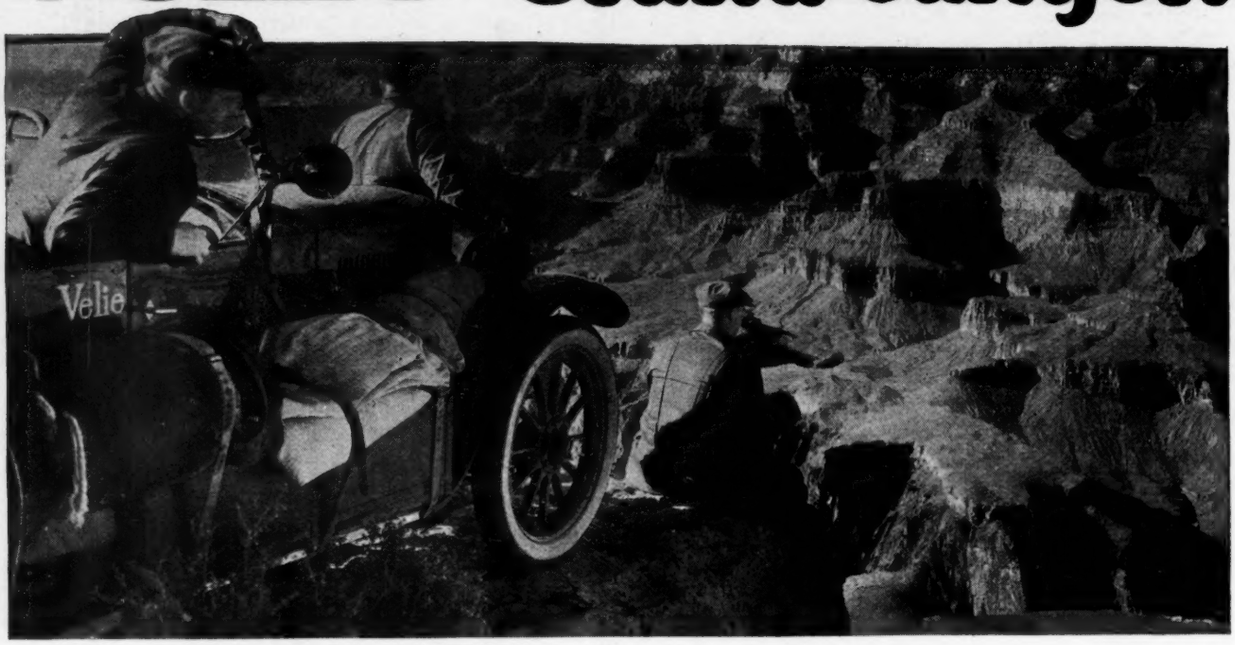
Michigan Motor Garment Co.

R. M. Beardslee, Manager

8 factories—Greenville, Mich.—*8 branches*

New York, 377 Broadway.
Chicago, 1016 Medinah Bldg.
Kansas City, 319 W. Ninth St.
Milwaukee, 606 Mayer Bldg.
Indianapolis, 466 Massachusetts Ave.
Des Moines, 607 Observatory Bldg.
Springfield, Mass., 147 Dwight St.
Cleveland, Ohio, 221 Marion Bldg.

Velie Conquers the Grand Canyon!



Wondering Where They Will Start—A Sheer Drop of Thousands of Feet.

Descends 5000 Feet Into Precipitous Abyss

AGAIN the intrepid Velie has won laurels by daring and stamina which mark it as the wonder of all sixes.

To the Gold Cup of the Yosemite—to its splendid record on Pike's Peak—to its Gold Trophy from Great Britain—it now adds its latest triumph, a successful descent into the Grand Canyon to the very edge of the Colorado River—*and a climb out again.*

All Under Its Own Power

A few weeks ago a Velie 34 stock touring car in charge of Harry A. Lord of the Los Angeles Velie Agency made the hazardous trip from the Canyon's top rim into the waters of the Colorado River at the bottom—sliding and tumbling downward 5000 feet into the very bowels of the earth and then worked its way up to the top—all under its own power.

The route was down and through rugged and forbidding steeps, the narrow walls of which at times would hardly allow the car to pass. The way led over rocks of every size and shape; through deep sands such as motor cars seldom encounter; through almost every known species of cactus; where there never was a road and probably never will be.

Lives Depend Upon Control

There were long stretches where moment by moment the life of the party hung on the dependability of the steering gear and brakes —where the slightest slip would have precipitated car and occupants into ugly, jagged chasms thousands of feet below.

The twists and strains were terrific—the Velie at times running at angles just short of upsetting.

The car took all this tremendous punishment without repairs of any nature; nor was there any water added to the radiator during the entire trip.

A handsomely illustrated booklet giving the complete story is just off the press. Send for a copy. It shows marvelous photographs of the Canyon in all its scenic grandeur and splendid views of the car at the most exciting points of the trip. Free for the asking.

Harder test was never handed a motor car and the Velie finished with a perfect score.

This is the same Velie Six that has won the admiration of all motordom for its splendid values and equipment, complete even to cord tires—*at the price of many Fours.*

It was picked at random from hundreds of stock cars. It simply upheld the Velie tradition of 11 years.

It has the Velie style with Velie genuine leather deep-plaited upholstery, the Velie lasting mirror finish—and the Velie economy in fuel, tires and upkeep.

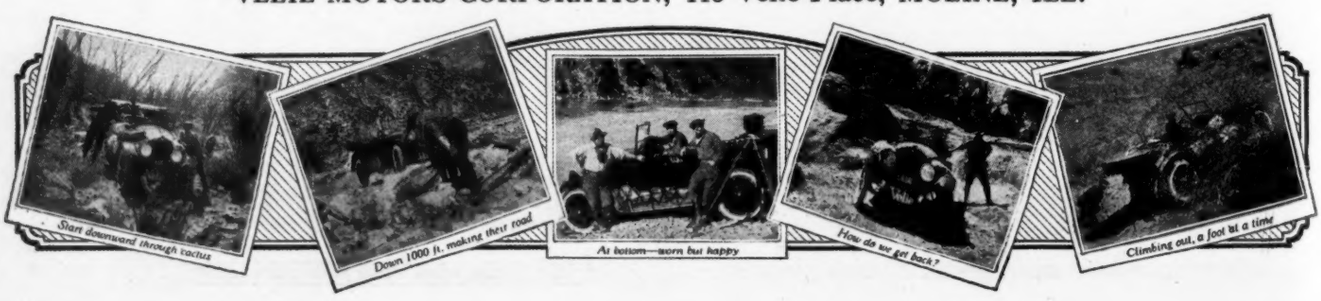
Velie a Leader In Sales

Velie sales are also one of the big records for 1921. The line includes Model 48—the still larger Six that is *another* sensation of the market for extraordinary quality at low price.

Eight new 1921 models on two chassis: five and seven passenger touring cars, sedans, coupes, roadsters and speedsters.

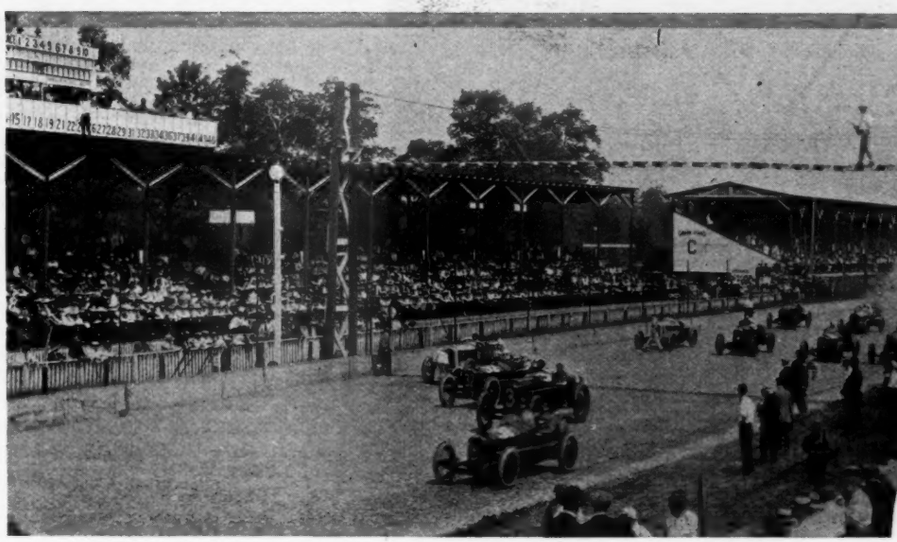
Dealers: **The Velie is backed by effective national advertising all the year 'round and by liberal co-operation with our dealers. We suggest that you make inquiry about your territory.**

VELIE MOTORS CORPORATION, 113 Velie Place, MOLINE, ILL.


Start downward through cactus
Down 1000 ft. making their road
At bottom—worn but happy
How do we get back?
Climbing out, a foot at a time

Vol. XXXIX, No. 22 Chicago, June 2, 1921 $3.00 Per Year

MOTOR AGE



The start of the 500-mile Indianapolis international sweepstakes. Right—closeup of Tommy Milton taken immediately after he had sent his car over the line a winner of the world's greatest motor classic

American Cars

Dominate 500-Mile Race

Lion's Share of Honors Divided Between Frontenacs and Duesenbergs—De Palma's Early Pace Falls Off

By B. M. Ikert

INDIANAPOLIS SPEEDWAY, May 30—An American car, the Frontenac, piloted by an American, Tommy Milton, won the ninth annual 500-mile Indianapolis race here this afternoon in 5.34:44.65 with an average speed of 89:62 m.p.h.

Roscoe Sarles driving a Duesenberg was second with an average speed of 88.61 m.p.h. His time for the 500 miles was 5.38:34.03. Jules Ellingboe driving Percy Ford's Chicago Frontenac took third position. His time was 5.52:15.30.

The rest of the field finished in the following order: Fourth, Murphy, Duesenberg; fifth, Ora Haibe, Sunbeam; sixth, Miller, Duesenberg; seventh, Ira Vail, Leach Special; eighth, Hill, Duesenberg; ninth, Ralph Mulford, Frontenac. Nine of the twenty-three cars that started finished the race, although there were ten prizes.

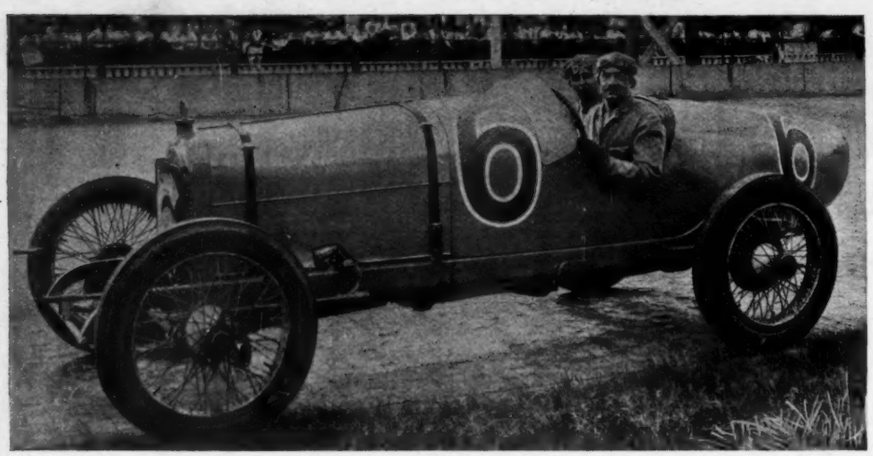
BIG DAY FOR FRONTENACS

It was a glorious day for the Frontenacs and their builder, Louis Chevrolet. These cars took, first, third and ninth positions. Milton's mount early in the race was clipping off the laps with clocklike precision, although he was not a dangerous contender for first position.

De Palma had everything his own way until the 112th lap when he had to drop out with a broken connecting rod. Ralph had been setting a terrific pace and literally burnt up his engine. He stopped just before the 112th lap to change plugs,

How They Finished and Their Time

Place	Car	Driver	Time	M.P.H.
First	Frontenac	Tommy Milton	5:34:44.65	89.62
Second	Duesenberg	Roscoe Sarles	5:38:34.03	88.61
Third	Frontenac	Jules Ellingboe	5:52:15.30	85.03
Fourth	Duesenberg	Jimmy Murphy	5:54:24.98	84.65
Fifth	Sunbeam	Ora Haibe	5:57:45.83	83.86
Sixth	Duesenberg	Eddie Miller	6:1:17.07	83.03
Seventh	Leach Spe'l	Ira Vail	6:14:17.47	80.15
Eighth	Duesenberg	Bennie Hill	6:19:06.74	79.13
Ninth	Frontenac	Ralph Mulford	awarded	



Roscoe Sarles in the Duesenberg which he tooled around the brick oval to second place and fame. Milton and Sarles had the fans standing up with excitement as they fought neck and neck for the premier honor

but stated then that the bearings in his fleet Ballot were going. Milton and a staff of mechanics worked until 2 o'clock this morning replacing something like thirty-two bearings in the Frontenac. Yesterday Milton stated that the bearings in his mount were too tight and it was decided to make the change—one which probably had much to do with his winning.

It is a singular fact that when De Palma dropped out of the race there was a decided slowing up in the time. Up to the time Ralph was tooling his Ballot around the oval the average speed was around 93 m.p.h. In setting this pace De Palma retained the lead and incidently took $10,600 in lap prize money.

MILTON AND SARLES BATTLE

Later in the race a beautiful speed duel sprung up between Milton and Sarles. Both cars were quite evenly matched and furnished many thrills for the spectators as first one and then the other would take the lead.

One of the features of the race was the excellent performance of Tom Alley, who drove the Frontenac of L. L. Corum. His, by the way, was the only car to be equipped with disk steel wheels. Alley was in third and second position for a long time when he was forced out by a broken connecting rod. He was one of the most consistent drivers of the day up to the time when he dropped out.

For a time it looked as though all previous records were going to be swept aside. No doubt the liberal purse and lap prize money had much to do with this. Last year the average speed for 200 mlies was 91.60, while this year the figure read 93.06 m.p.h. But when DePalma's Ballot went out the rest of the field was content to take it a little slower and thus save their mounts as much as possible. In the early part of the race Howard Wilcox, winner in 1919, driving one of the French Peugeots, was bunched with the leaders and was putting up a beautiful race when he had to drop out on the back stretch with a burned out rod that let go and smashed a bad hole in the crankcase. Wilcox was the first man to drop out of the race. The high speed evidently played havoc with many of the others who were forced to abandon the race from mechanical troubles. The troubles, however, were quite evenly distributed, connecting rod breakage, steering knuckle breakage, camshaft, axle, etc., all coming in for their share.

SMALL ENGINE PROVES ABILITY

While Milton did not quite equal the record of Ralph De Palma when the latter drove a Mercedes to victory in 1915 in 5.33.55.5, equivalent to 89.84 m.p.h., it must be remembered that the Mercedes was fitted with an engine of 300 cu. in. piston displacement, while the engine in Milton's car is but 183 cu. in. There is but .22 difference in the miles per hour average of the two cars, so in reality it can be taken as a great victory for the smaller engines.

It also is interesting to note the difference in time made by some of the cars that were entered in the 1915 event and those which fought for supremacy on the gasoline circuit today. Take the pace for 100 miles for example. In 1915 De Palma's mark for the century was 1.07.31, while his time today for the same distance was 1.04:25, about 3 min. faster.

Then again let's compare the figures of the same years for the 250-mile mark. In 1915 the Mercedes had set a mark of 2.47:06 for the distance, while De Palma today covered the distance in 2.40:20. So it is possible to go on and on with the times for the various other distances, with the exception, perhaps, of those lying between the 400 and 500 miles.

The reason for this is simple. There is always some driver or drivers who force the average miles per hour up early in the race and the rest of the field, if they are able, try to keep within reasonable distance of the leaders. But, the terrific pace often tears up the engines of the cars and as the dangerous contenders are eliminated, the lesser lights burst into prominence, but generally with a lower average miles per hour, because they figure the race can be won without pushing their mounts the limit. Had De Palma been able to stay in the race today, it is quite certain the average miles per hour would have been well over 90.

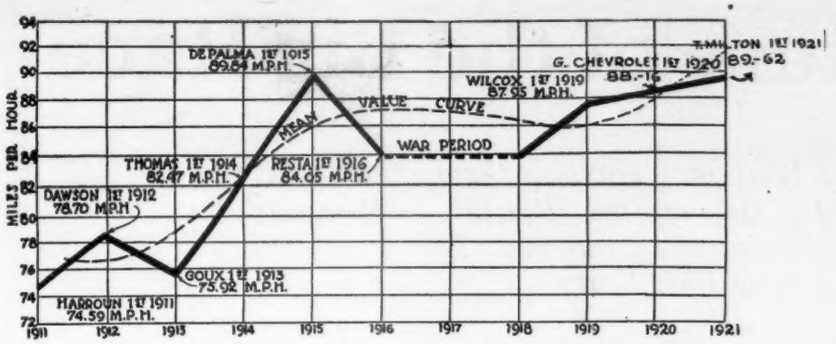
Contrary to expectations the foreigners this year did not give as good an account of themselves as in previous times. Fifth position was the best any foreign car could obtain and this, by the

Jules Ellingboe, who won a name for himself on dirt tracks, made his first speedway debut in the International 500-mile race held at the Indianapolis Speedway, May 30th and carried away third place

Dividing a Fortune in Prizes

Driver	Purse	Lap Prizes	Total
Tommy Milton	$20,000	$6,200	$26,200
Roscoe Sarles	10,000	100	10,100
Jules Ellingboe	5,000	.....	5,000
Jimmy Murphy	3,500	.....	3,500
Ora Haibe	3,000	.....	3,000
Ed. Miller	2,000	.....	2,000
Ira Vail	1,800	.....	1,800
Bennie Hill	1,600	.....	1,600
Ralph Mulford	1,500	.....	1,500
Ralph De Palma	.....	10,600	10,600

In addition to his prize winnings, Tommy Milton received awards from equipment manufacturers which brought his winnings to approximately $36,000.



Here is a graphical representation of what the winners have done on the Hoosier oval since the inception of the first 500-mile race in 1911. It shows the average speeds in miles per hour for the various winners. Note that this year the curve has taken a rise from last year when the late Gaston Chevrolet drove a Frontenac to victory at an average speed of 88.16 m. p. h. From the chart it will be noted that the small engines are gradually overcoming the lead made in 1915 by De Palma's Mercedes, which had a piston displacment of 300 cu. in., while this year the cars have but 183 cu. in.

way, was piloted by an American driver, Ora Haibe. His Sunbeam performed admirably, but was just a little too slow evidently to land better than fifth. Rene Thomas and Andre Boillot who had been counted upon by many to make it interesting for the leaders were forced out of the race with mechanical difficulties.

Chassagne in the Puegeot was unable to continue the race because he lost the hood of his car and was unable to find it on the track. It is against the rules of the A. A. A. for a car to run in a race without a hood. The other foreign car, the Peugeot driven by Wilcox, as was stated before, was the first car to drop out with a burned-out rod.

The race was full of thrillers and one of the most gratifying things about the event was the fact that none of the contenders were injured. Joe Thomas in a Duesenberg staged a thriller for the crowd in his 25th lap when a broken steering knuckle made his car crash into the retaining wall on the south turn of the home stretch and then ran into the lower wall. Neither Thomas or his mechanic was hurt, but the car was relegated to the also-rans. Fontaine, DePalma's old mechanic, and his helper jumped with their car, a Junior Special, through the wall on the north turn into the home stretch, but neither was injured.

Again on the north turn coming into the home stretch, Jimmy Murphy's car turned around three times on the track, but in the hands of its capable driver was straightened out and brought to the pits. A broken steering knuckle had caused the accident. The car was repaired and sent on its way again, with Pullen driving in place of Murphy.

MAKE EXCELLENT APPEARANCE

One noteworthy feature of the cars this year was the excellent manner in which they were finished. Many of them looked more like show models than race cars. In the old days it was common to see all sorts of contraptions on the cars which broke the continuity of line.

With but a few exceptions the cars in today's race, aside from being extremely fast, were beautiful to look upon. Some of those especially worthy of comment along this line were Wilcox's Puegeot, Alley's Frontenac, DePalma's Ballot, Sarles' Duesenberg and the Junior Specials. The builders of the Leach Special did not have time to paint their car, which would have added greatly to the looks of an otherwise well designed and built car.

There is always much of value coming out of racing that can be applied to the design and manufacture of our commercial passenger cars and trucks. While today meant a great deal to the winner of the race, the car designer and builder as well as the people in general, it meant still more to those associated in any way with the automotive industry.

The fact that the engine in the winning Frontenac was a straight-eight, that is, one in which the eight cylinders are set in a line, probably does not mean much to the average individual, but you can rest assured that it means much to designers and builders of anything that partakes of an automotive nature.

DEVELOPING STRAIGHT EIGHT ENGINE

For one thing it is possible to make many of the engine parts much smaller. Thus, the pistons in these small engines are about 2½ in. or even less in diameter. There is a decided saving in weight, although in race cars the weight of the engine is not so serious a matter as in aircraft work.

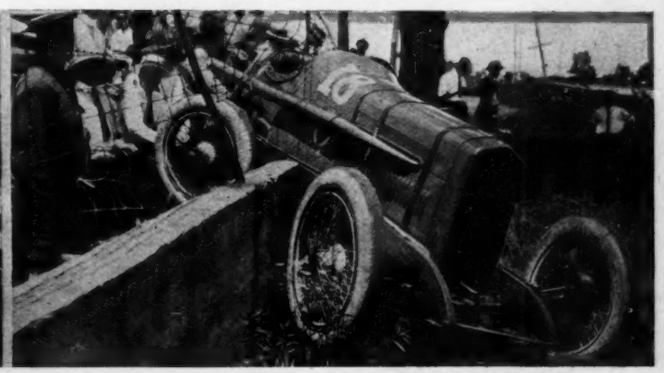
The race track is one of the most essential experimental departments of the industry. It is but a step from the development of the straight-eight engine on the track to its adoption as standard practice in passenger cars. In fact it is possible now to buy cars so equipped.

Front wheel brakes have been a decided success on racing cars and it would not be surprising to see within the next few years much development along this line for passenger cars.

Then there is hood ventilation. Most of the cars this year made some sort of provision to cool the inside of the hood properly at sustained speeds. Anyone who drives the average car knows that the driving compartment gets very hot and we believe there is a chance for designers to study racing practice with the idea of applying much of it to commercial purposes.

We shall probably never get to the end of development work on the speedway, but put it down in black and white that racing is not first, a great sport and second, something from which to make deductions. It is the most valuable laboratory we have.

Some say there were 150,000 people who saw the race and this picture, which shows but a minute section of the great oval, seems to bear out these statements



It takes a long time to put a race car together but it takes only a second or two to render almost to the state of scrap steel. This is Fontaine's car after it went through the track

A Word Picture of the Big Race

There Is No Better Way to Visualize the Indianapolis Race Than to Read a Description Written in Running Form—Whether You Saw the Contest or Not You Will Enjoy This Story

INDIANAPOLIS, Speedway, May 30—9:30—The stands are filling fast as the first faint blare of the band floats on the light breeze. Ralph Mulford, who has been tinkering his car gets a big hand as he slides through the gates and up to his pit while the movie men grind off another two feet of film.

9:45—The cars are lining up De Palma, whose generalship won him pole position in the elimination trials, leading the string and taking his position at the head of the flock. Beside him is Roscoe Sarles.

9:50—First gun, and as the stilled motors receive their last grooming, a lone airplane snores its way overhead visible evidence of the conquest of speed between land and air machines.

9:55—As the second gun booms out, mechanics spin their motors. Fontaine's Junior Special belches smoke and fire. A backfire has ignited spilled gasoline. The fire extinguisher brigade has its first exercise and the blaze is out. Already a haze of castor-oil smoke smirches the atmosphere as motors are warmed and drivers and mechanics take their seats. Clean, the cars look, and well-groomed, far cleaner and better groomed than they will be a few hours hence.

10:00—They're off. History is in the making. There they are, way around on the far turn, great beetles creeping their way around the rim of a saucer. The stands are on their feet as the bunch straightens out for the stretch. The starting gun.

Louis Chevrolet, the veteran race car driver and designer, was all smiles as the car he had helped construct got the checkered flag, making the Frontenac victorious two years in succession

10:02—De Palma leads the bunch under the wire. $200 for Ralph. The pace does not appear fast. It seems almost as though cars are being saved. A gap of only a few feet opens between De Palma's fleeting Ballot and the twin Duesenbergs that lined up with him.

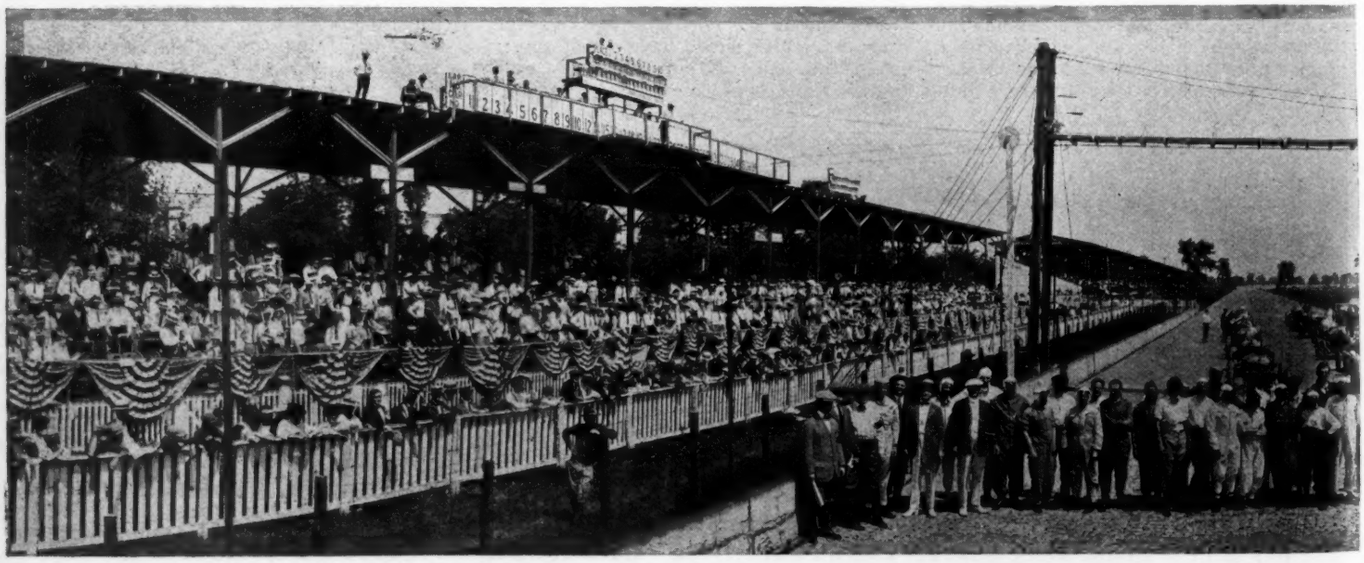
10:04—Sarles has outsped De Palma and takes the prize for the second lap. But Ralph is close behind him and has easily passed him by the time the bunch gets around the third time. The field is far spread and no longer will a blanket cover them all. Vail in his Leach Special hurries by at the tail end of the procession.

10:06—Sarles again leads the leaders as they bear down on the stands. But a hundred yards or so from the wire De Palma shoots out, driving high on the track, and takes the lap. De Palma leads again in the next lap, with the others holding tight to his tail. De Palma's time for the 10 miles is 6:40. 75.

is 6:40. 75. Thomas limps into his pit, first of them all to make a stop. He cleans six plugs and starts again.

10:11—Ralph holds doggedly to the lead with Howdy Wilcox in his Peugeot and Joe Boyer's Duesenberg nearly wheel and wheel with him. Next comes Sarles, who has dropped back to fourth, and Eddie Hearne pushes his Revere behind these four. The others are now about one-sixteenth of a lap behind and spread all the way around the track.

10:14—Here comes Ralph again. He has opened up a wider gap between him-



Just before the starting bomb the greatest aggregation of stars ever to compete in an automobile

self and Boyer. And behind these two comes Vail, who has crept up. The cars seem far quieter than they have in years gone by.

10:20—De Palma is leading and at the end of 20 miles has brought the pace to 96.16 m.p.h., his time for the distance being 16:27.31.

10:23—At 25 miles Joe Boyer trails De Palma, with Wilcox running third and Sarles in fourth place. Eddie Hearne has forced his way up to fifth and close behind him is Alley in one of the Frontenacs. Ellingboe, in another of the Frontenacs, is next with Boillot, Murphy and Van Ranst trailing along in that order.

10:26—De Palma and Boyer have opened up the gap between them and the next bunch, the others maintaining their same relative positions.

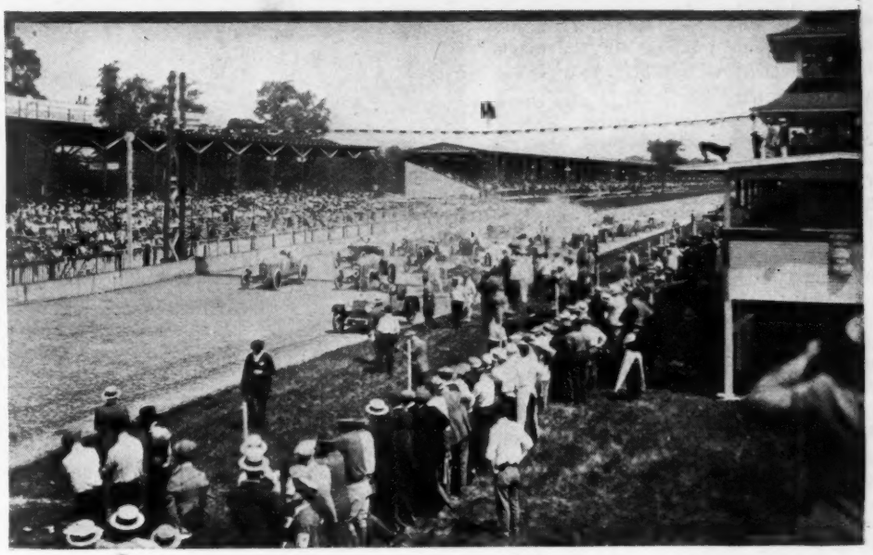
10:29—They're all going great guns, Henderson who was out for a short time having rejoined the pack that is trailing De Palma's yellow Ballot. The pace is fast but it has not yet begun to tell.

10:31—De Palma seems to have increased his gait a little; or has Boyer slowed a bit? For the gap between these two is steadily widening and the field is trailing far behind. First evidences of the terrific strain on tires become apparent as shreds of tread start to fringe some of the wheels.

10:35—The crowd has tired standing, as the race settles down to a grind.

10:36—The pace has slackened appreciably as the 50-mile mark is passed. The scorers chalk up 92.62 as the average and 32:23 for the time.

10:27—Howdy Wilcox, veteran of half a score of years of racing has quit, the first of bunch to succumb to the strain. A snapped connecting rod has quieted his Peugeot. De Palma still leads, having opened still more the gap that separates him from Sarles and his Duesenberg. Boyer is about as far again behind Sarles, with Alley fourth and Eddie Hearne fifth.



Awaiting the start with the engines idling and impatient to be off on their thrilling journey. They will be paced one lap by Harry Stutz in an H. C. S. shown at front and to the right

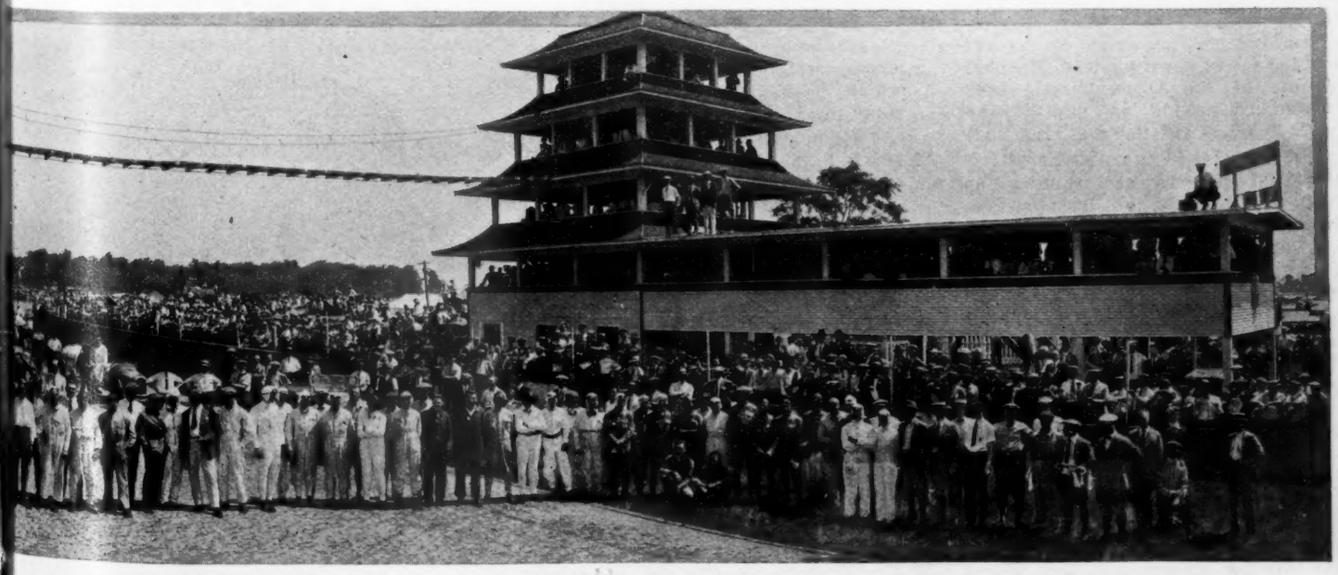
10:45—Boyer slides into his pit and Milton, who has been steadily pulling along eases up into fifth place. Eddie Pullen and his Duesenberg have a narrow squeak. Driving to catch the fleeting leaders his car skids into the retaining wall on the far backstretch turn, straightens itself out and rushes after the leaders again, apparently little the worse for the bump.

10:49—Tom Alley has worked up into third place as De Palma reels off 75 miles and hangs up a new track mark for future pilots to aim at. Ninety-two, point eight-one is the new figure, and to make it De Palma has had to take every lap but two, the second and the seventh. Two cars have quit by this time, a broken steering knuckle having laid Thomas' Duesenberg alongside of Wilcox's Peugeot.

10:55—De Palma has increased his lead over Sarles to half a lap of the saucer, and Sarles in turn is a long way in front of Alley whose Frontenac pounds along just ahead of Hearne. Boyer stops again as De Palma slowly but surely creeps around within striking distance of lapping Hearne, holding precariously to fourth place, some 53 seconds behind the Ballot.

10:59—The pace quickens to 92:87 m.p.h. as the leaders fly by at the 75-mile mark. De Palma is leading Sarles now by 35 seconds and the five leaders remain about as they were. Hearne is closing the gap himself and the De Palma, but there is no shortening of the gap between the Ballot and Sarle's Duesenberg.

11:03—Now Sarles is dropping back a little, as De Palma raises the pace a peg and gains a little on them all. Mulford, who has been staying with the bunch, stops in his 38th lap.



race lined up for the official picture of the Ninth Annual Indianapolis 500-Mile Sweepstakes, May 30, 1921

11:08—Ralph has been stepping on his Ballot to some purpose for the mark for 100 miles which last year stood at 91:36 m.p.h., now is 93.14 and there is no letting up in the pace. Sarles is still hanging onto second, though there is a big gap between him and De Palma, who has reeled off one-fifth of the race in 1:04:25.

11:15—Boillot, too, has become a spectator, now, a burned out connecting rod bearing putting his Talbot-Darracq out of the running in his 41st lap.

11:17—Alley has forced his Frontenac up into third place, and Eddie Hearne's Revere has dropped back and is now fourth. Alley is challenging the leaders. All efforts have centered on defeating De Palma alone. A whisper comes from the pits "Get the Ballot." No matter how seriously De Palma's chances of winning were taken before the start, there is no gainsaying his chance right now.

11:28—Sarles is creeping up now on De Palma, and Alley has dropped back into fourth, Milton having come up into third.

11:29—Fontaine, in a Junior Special, has joined the ranks of those who have fallen by the trackside. In his 34th lap, running nearly a dozen laps behind the leaders, his car skids on the grandstand turn, overturns and is out. Fontaine and his mechanic climb out, unhurt. Frozen brakes cause the trouble.

11:30—The pace steadily increases and at 125 miles stands at 93.32 m.p.h., De Palma's time for the distance being 1:20:22. Not much change in the order of the leaders.

11:34—The first five drivers are all in the same lap, though no blanket is big enough to cover them. It is the first time in any 500-mile race that five cars have run so long together.

11:37—And still the pace increases. Efforts to catch De Palma have forced the average up to 93.33 m.p.h., as compared with 90.25 in the last race. De Palma's time for 150 miles is chalked up as 1:36:25.

11:41—De Palma laps Alley, Sarles, Milton and Hearne, as efforts are redoubled to cut down his lead. Murphy, in one of the Duesenbergs, skids completely around on one of the turns, bounces off the retaining wall and drives slowly down to his pit.

11:48—Eighteen cars are running as Eddie Hearne pulls into his pits, thus dropping out of fifth place and allowing Van Ranst in a Frontenac to come up among the first five.

11:50—De Palma laps Sarles as the two pass under the wire. Thus the Ballot pilot has a few seconds to spare for that almost inevitable stop. On the next lap around De Palma has opened up quite a gap between himself and Sarles who seems unable to hold the terrific pace. Ralph's mechanic gives every indication of enjoying the ride, and De Palma, himself must feel pretty good—about $10,000 to the good, $200 for every lap but two.

11:55—The five leaders hold their places though they are strung out all around the track. De Palma steadily creeps away from Sarles, nearest man to him, but it seems impossible that he can continue much longer without stopping and sacrificing some of his lead.

NOON—And De Palma is now two full laps ahead of Van Ranst, whose Frontenac is the tail-ender of the first five. Milton who has been pushing his Frontenac has crept up on De Palma and for a few brief seconds his number showed large on the score board as being in the same lap with Ralph. But on the next lap De Palma has increased the pace and Milton drops back again and once more is in the second contingent, he and Sarles, and Alley being a lap behind with Van Ranst three laps behind.

12:06—Milton, nearest man to De Palma, though more than a lap behind him, rolls into his pit, letting Sarles push up into second place, and Milton continues, after a brief stop, in fourth place. Van Ranst has now picked up one of the laps he was behind the bunch, but Tommy Milton has lost another lap, changing both rear tires and filling up with gas and oil.

12:08—The average remains the same as the 175-mile mark is passed. The clockers catch De Palma in 1:52:38.25, which is slightly slower than the same mark last year when the average stood at 93:66 m.p.h.

12:12—But at 200 miles the pace quickens again, and climbs to a level with last year's mark of 93.66 m.p.h. No need to add that De Palma is leading; the other four nearest to him try desperately to catch him. But the lead of the Ballot remains the same.

12:15—Joe Boyer, Duesenberg pilot, rolls up to his pit with rear axle trouble and is out of the race in his 74th lap, as De Palma leaves Sarles another lap behind. He and Milton are now two laps behind, Rene Thomas has driven his Sunbeam up into fifth place, three laps behind the Ballot. Alley still holds to second place, but is considerably more than a lap behind De Palma.

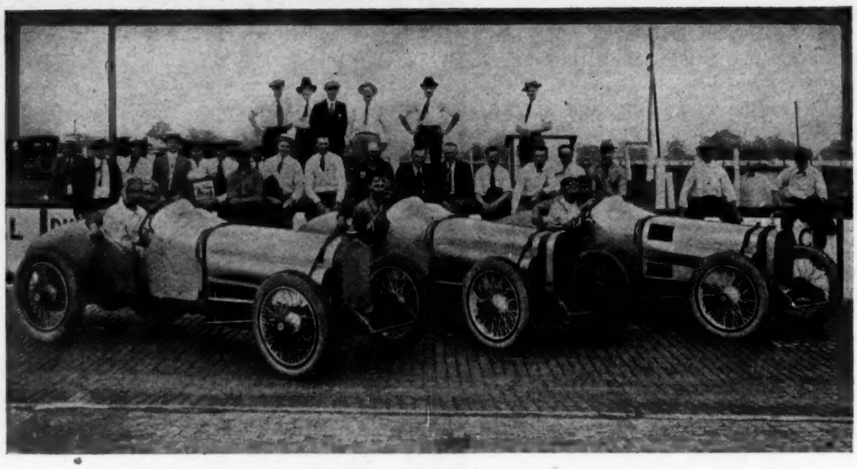
12:21—Six cars are now out, Chassagne having been forced out in his 66th lap through the loss of his engine hood. Ellingboe, having had his Frontenac at the pits for 45 minutes, starts again.

12:27—No breathing spell this year as the half way mark approaches. The pace remains the same at 225 miles, De Palma's average being 93.66 m.p.h. as compared with 91.35 which was last year's mark. De Palma's time is 2:24:09.15, and his lead over the others is unchanged. Alley and Sarles are still a lap each behind, with Alley leading and Milton and Thomas are each three laps behind.

12:32—De Palma's generalship is superb. Hardly by hundredths of a second do his lap times vary, and his position on the track is always the same. He tears along, now, close behind Sarles, already a lap behind, and soon to be two laps back.

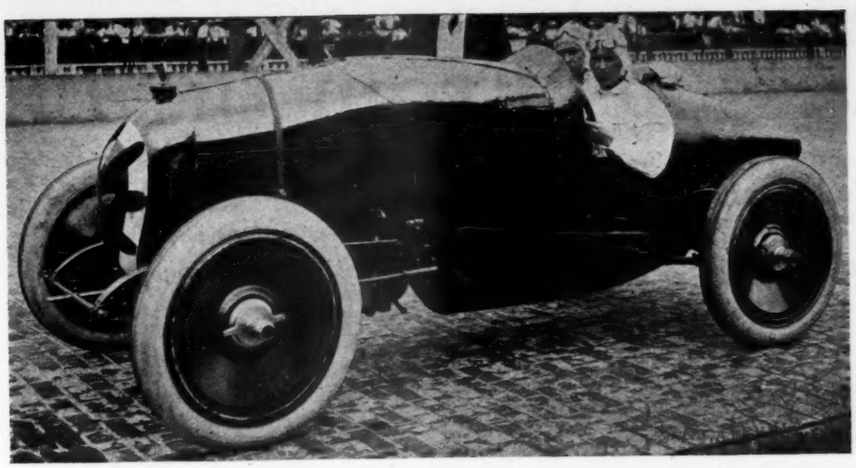
12:35—Alley, running in second place stops for gas and changes place with Sarles who has shortened by a little by the lead that De Palma has over him.

12:37—De Palma's engine stutters as he flashes past the stand in his 98th lap,



Out of this formidable array of Sunbeam cars only one finished, that driven by Ora Haibe. Mechanical trouble forced both Thomas and Boillot out of the running

C. W. VanRanst, who has been Louis Chevrolet's right hand man in the designing and constructing of the utmost in racing cars made his debut as a big league driver in the 500-mile race



This is the Frontenac with which Tom Alley put up a beautiful race until he was forced out by a broken connecting rod. The car was the only one fitted with disk steel wheels

and every ear is tuned to catch him the next time around. Again, the ominous stutter. Will he stop? Can he hold the lead so hard won? Again he flashes by. The stutter is gone, but the slight slowing up has cut down his lead a little.

12:44—De Palma will stop next lap. He rushes past with the mechanic's arms high over his head in a circle. As he pulls in the mechanic opens the gas tank, and the five in the leading contingent urge their flying cars to greater speed. De Palma is at the half way mark. It is his first stop. His average is 93.52 m.p.h., and his time 2:40:23.

12:47—The four behind De Palma's Ballot are now two laps behind, Thomas having improved the opportunity to run up on an even footing with Alley and Sarles.

12:48—Hurry, Ralph, Hurry! Your lead is dwindling. One lap now separates you from the four closest behind. Seconds, now. Seconds, it stays, De Palma leads by inches, almost, as he pulls out, still a lap to the good having lost just over four minutes. Milton pushes him hard. A scant 12 seconds separates these two rivals.

Tom Alley came down to the track about the day before the race and showed that he was as good as ever by putting the Frontenac in second place for many laps

12:49—De Palma increases his lead over Sarles by a few seconds. The two are a lap ahead of their nearest rivals. Sarles fights for second place, which has been taken by Milton.

12:58—Twenty-two seconds, now between De Palma and Milton. The gap widens slightly. Another car has failed, Van Ranst's Frontenac being forced out in its 88th lap with a broken water connection. Fifteen drivers left, but only four within striking distance, barring serious accident.

1:02—De Palma stops again in his 110th lap and in 33 seconds Milton has wrested the lead from him. Its anybody's race now, with Sarles running second, though nearly a lap behind Milton, and De Palma now a lap behind and on an even footing with Alley.

1:10—Milton is leading nicely, with Sarles, Alley and Thomas each a lap behind. De Palma is not going strong. His car limps, almost, as it whirls past the stand with hardly any indication of its previous speed. Another lap and he stops again.

1:14—De Palma has dropped back now out of the class that made up the first five and Miller who has been forcing his Duesenberg steadily after the leaders has moved up into fifth place.

1:16—De Palma is out! Unable to stand the frightful strain, a connecting rod in his Ballot engine let go and the driver to whom thousands in the great stands had pinned their faith was forced once more to become a spectator. He smiles as he climbs out of his car and it is the smile of a real sportsman.

1:22—At 275 miles the pace has slowed considerably. Milton flashes by in 3:00:57.97; his average is 91.18 m.p.h. Gradually he opens up the gap between himself and the others until he is two laps ahead of Alley, and Sarles, and three laps ahead of Miller and the Sunbeam driven by Haibe, who is substituting for Resta.

1:25—With De Palma out, the pace slows and at 300 miles the average stands at 90.36 m.p.h. Milton's time is 3:19:11.64 and he is slowly increasing his lead.

1:23—The cars are well bunched now and there are periods of comparative quiet with nothing for the grandstands to look at but a couple of airplanes circling high overhead. With the passing of De Palma interest seems to flag, though the race is only three-fifths over.

1:36—The two Sunbeams are now running almost together, with Thomas leading his teammate Haibe and both a lap behind Alley and three laps behind Milton.

1:40—At 325 miles, the speed is still slower, a little, but enough to make plain the efforts of drivers to save their cars, now that De Palma and some of the other serious contenders have been eliminated. The average now is 90.33 m.p.h., and the clockers catch Milton in 3:35:52.

1:45—Fourteen cars are still running, Bret, with his Junior Special quitting in his 91st lap. His car is badly sprung in consequence of bumping the retaining wall some time before. He starts it. He wants to continue. But the judges say "no"! He quits.

1:50—Tom Alley appears far down the track pushing his car, himself on one side and his mechanic on the other. He has lost his third place, lost th race. Another connecting rod gone wrong.

1:52—When Alley retires, Guyot pushes his Duesenberg up into fifth place, four laps behind Milton. Sarles, who is second, is two laps behind Milton's Frontenac, as is Thomas and his Sunbeam.

1:57—Eddie Hearne is out. He quits in his 111th lap with a broken oil connection and valve trouble. With only 150 miles to go, the pace still stays over the 90 mark, Milton's average now being 90.22. This time last year the average was 90.78. Milton's time is 3:52:45.95.

2:02—Milton's Frontenac slides smoothly around the track, and it ought to, for no car has been more carefully groomed. Every bearing in the engine is new, was put in new on Sunday night, a job that kept Milton and his mechanics busy until two in the morning of the race. His care is earning its reward for he easily holds his lead of two laps over Sarles, his nearest contender.

2:07—Long distances separate the five leaders. Two laps are between Milton and Sarles; three are between Sarles and Thomas; two are between Haibe and Thomas; and two are between Guyot and Haibe. It's a procession. Thomas stops and Percy Ford moves up into fifth place.

2:15—Only 125 miles to go and 10 cars still left in the race. The 90-mile gait has accounted for 14 of the 24 original starters. There's a prize there, now, for every one that's left. The average now is 90.34 m.p.h., and Milton's time is 4:09:03.80.

(Concluded on page 16)

Service Lessons From the Pits

Far-Sighted Organization of the Indianapolis Speedway Track-Side Repair Service Stations Forms a Chapter Which Should Receive the Careful Study of Mechanics and Service Executives

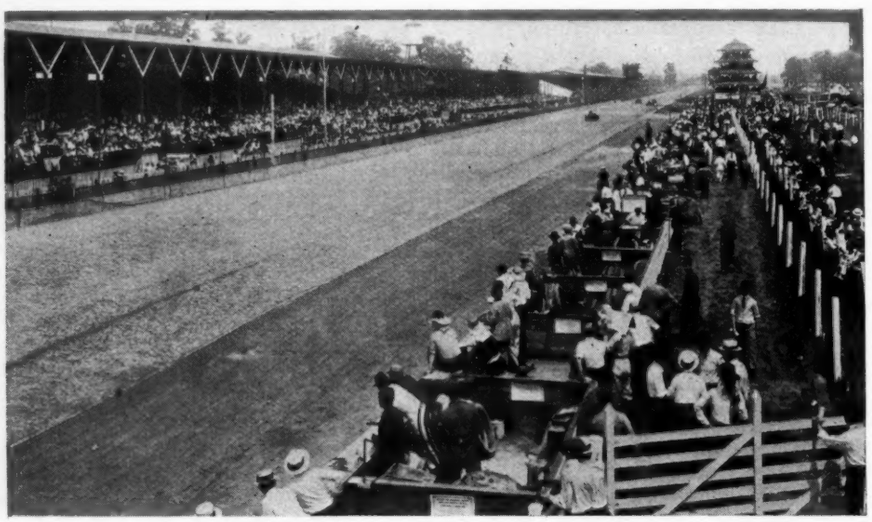
By W. H. Hunt

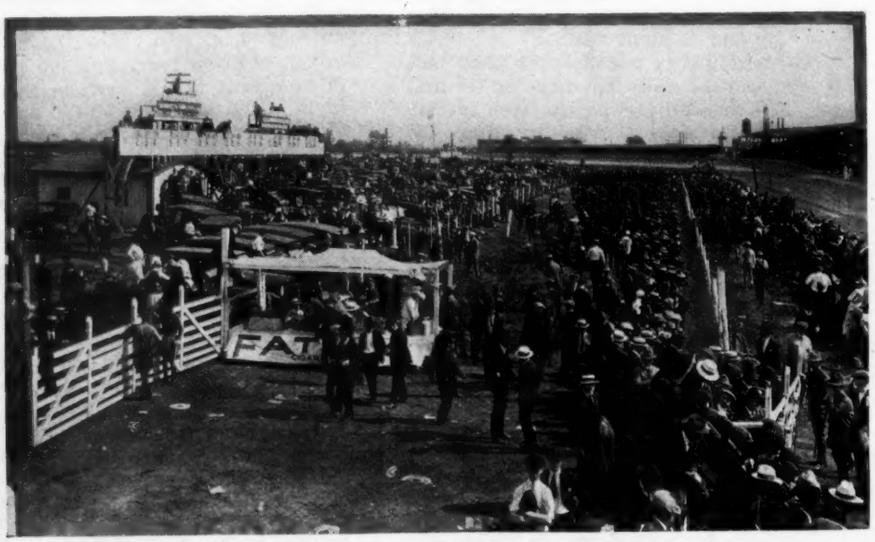
TO those close followers of the sport of automobile racing this account of the 1921 Hoosier classic will smack strongly of previous contests, carrying them back to earlier days before the 300 cu. in. engine and the sturdy chassis in which they were installed had been brought to such a high state of perfection that pit-work became a secondary feature.

This for the reason that the recent race was nearly as much of a battle of the pits as it was a contest of speed, skill and judgment.

Service department executives would have received many valuable pointers on high-speed, reliable service had access to the pit paddock been permitted to them. Tire changes in 1 min., 15 sec., spark plug changes with carbureter and throttle adjustments in 5 min., the installation, including bushing of steering knuckles in less than 15 min., and several other operations which actually come under the head of service were performed in record setting time.

Still, to the experienced observer there was nothing miraculous in the work, in fact, on the contrary, so smoothly and with such ease were the various jobs performed that one hardly realized that anything out of the ordinary was being done. Perhaps many will object that the high efficiency shown was attributable to a well trained personnel and first class equipment.





These two pictures will give the reader some idea of the pits, from which many a race has been won or lost. Good pit work is an essentiality to winning a race

THE RIGHT TOOLS

The points are granted without controversy, the argument being that such equipment, if not personnel, is within the reach of every service establishment and that with it first class service of nearly, if not quite as high speed as that performed at the pits can be rendered. Take spark plugs changes for instance. No attempt was made to tease refractory plugs from inaccessible pockets but, instead, the proper size T handle socket wrench was always to be found in exactly the proper place not once, or twice, but every time.

Likewise when it became necessary to change a wheel there was no aimless hunting for a jack and wrench. The long lever roller type jack of a common, well known make as well as the correct wrench were so disposed that they were instantly available. As no great skill was required to do the actual work the principal credit must be given to the organization and system.

Spark plugs were the chief offenders there having been fifteen stops necessitated by the faiure of these vital units.

The plugs themselves, most of them of a well known and very satisfactory make, cannot be charged too heavily with the poor showing as, in full 90 per cent of the cases the fault was found to be such a flooding with oil as no plug could have withstood and continued to function properly. Next on the list after plugs as a source of trouble came tires, and this despite the paradoxical fact that

there was no tire trouble, the changes of which there were fourteen being made as measures of precaution.

Broken and burned out connecting rods caused little trouble for, though frequent, as might have been expected on account of the high engine speeds, they necessitated no labor, the drivers of the unfortunate cars simply quitting the race in disgust. Such was the fate of Ralph DePalma who, after making one of those brilliant records, which the public has come to expect from him, came to grief in the 112th lap with a broken bearing which allowed the connecting rod to wreck No. 5 cylinder and also puncture the crankcase.

THROTTLE STICKS WIDE OPEN

Steering knuckles proved to be weak members on Edw. Miller's and J. Murphy's Duesenbergs and it was the operation of replacing and repairing them, 23 min. and 15 sec. and 12 min. and 45 sec., respectively, that called forth the appreciation in a previous paragraph. Carbureter failure may be said to have been absent the only delay on this score being to Eddie Hearne's Revere Special in the 96th lap. Even this could hardly be accurately classified as a carbureter adjustment as it was reported that the trouble was really due to water which by some mischance, got into the tank.

This seemed to be borne out by the fact that after removing the float and allowing the carbureter to flood copiously and also draining the pipe the difficulty was remedied and the machine again took up the grind. Andre Guyot also experienced some slight delay which was at first believed to be due to faulty carburetion but which was quickly traced to a partially plugged pressure feed line. Clearing the line put things right again and the car was as good as ever. Only 12 min. and 50 sec. was required to diagnose and remedy the ailment.

MULFORD RETIMES ENGINE

Another fault rather of control than of carburetion nearly resulted disastrously for Murphy when the sticking of the throttle of his Duesenberg just as he was coming into a turn hurled him around the curve with a wide open, uncontrollable engine. After some spectacularly clever jockeying he completed the circuit, brought his car into the pits and supplemented the control with a length of wire; time, 5 min.

Checking and adjustment of timing consumed 18 min. 20 sec. for smiling Ralph Mulford. It seemed to be well worth while as, following the operation, his Frontenac thundered away with a new zest and vigor. This was the only operation of the kind performed.

LUBRICATION IS A PROBLEM

Questionable lubrication was the prime cause of many exasperating delays there being either an insufficient amount, as in the case of those who lost their chances of victory through burned out bearings, or too much as was witnessed by those others who were badly handicapped by frequent stops at the pits for one, two, four, or, in some cases complete sets of eight plugs.

This latter suggests the thought that the problem of piston lubrication of the very high speed engines necessitated by the now two year old 183 in. displacement limit is one which will call forth the highest degree of ingenuity on the part of engine designers for some time to come. That it will be solved there is no reason to doubt and it is quite likely that the experiences gained from this race will form the data from which the solution will be evolved. In this connection it may be suggested that improved rings and more perfect ring fits may form fit subjects for considerable study.

This is mentioned as the result of chance remarks by more than one of the mechanicians to the effect that the ring fits of some of the machines which were over oiling badly were not the best that was reasonable to be expected.

SOLDERED CONNECTIONS MELTED

Ignition faults were negligible, the only serious one being that which retired C. W. Van Ranst's Frontenac in the 87th lap. This was also a case in which the actual failure could not be charged to the apparatus proper. Some soldered connections became melted and loosened and the solder, falling onto vital parts proved destructive to them. Neither this nor Ralph Mulford's difficulty can be rightly attributed to a failure of any of the standard units.

On the whole the rear axles made a most enviable record there being only one failure directly chargeable to this unit. This happened to Joe Boyer's Duesenberg. It consisted of a broken right axle shaft and probably resulted from the terrific punishment the determined driver subjected his willing mount to in his plucky effort to wrest the lead from the flying DePalma. So unexpected was the circumstance that no provision in the shape of a replacement

Analysis of the Pit Stops, Number, Reasons and Duration

Car No.	No. Stops	Tire Chgs.	Time		Car No.	No. Stops	Tire Chgs.	Time	
1	4	1	13.12	Principally spark plug failure. One carburetor adjustment. Gasoline, oil and water. Out 111 lap, broken oil pump.	14	0	0	0	Out in 41 lap. Faulty lubrication resulted in burned out connecting rod bearing.
2	3	1	4.30	Gasoline and oil necessitated three stops. Two tires changed during one of these.	15	1	1	4.12	Tightening shock absorbers, changing tires. Water, gas and oil. Out in 144 lap with broken water connection.
3	2	1	5.09	Oil fouled spark plugs, changed. One stop to change drivers. Gas, oil and tires.	16	5	1	15.20	Three stops for gasoline and one for oil. Changing mechanics necessitated another.
4	1	0	5.	One complete set of 8 spark plugs. Out in 112 lap when broken connecting rod bearing caused partial wreck of engine.	17	4	1	13.10	Oily plugs. Two tires changes for luck and one stop for a drink. Out in 91 lap. Left track and broke shock absorbers and left front spring.
5	2	2	15.45	Repairing a steering knuckle and replenishing gasoline and oil. Tire changes made at same time.	18	1	0	5.15	Foul plugs. Wrecked car in 24 lap. Out.
6	2	1	3.30	Some plug trouble necessitated one stop. Fuel, oil and water accounted for another. Tire changes were made during both.	19	1	0	5.30	Flagged down in 64 lap on account of having lost bonnet. Allowed one lap to recover it. When found it was twisted and useless. Failed to make a substitute fit and was ruled off in 65 lap.
7	2	0	7.15	Oily plugs brought this car in twice. No other trouble. Axle shaft broken by ramming track retaining wall. Out in 74 lap.	21	2	0	8.30	Replenishing gasoline and changing drivers. Repairs to ignition.
8	6	0	48.24	A recheck of the time and ignition apparatus consumed 18.20 of time. Shock absorbers lost 10.32 more and removing the radiator guard killed 4 minutes. Trouble with the bonnet and taking on gasoline, oil and water accounted for the rest of the time. Given the checkered flag and 9th place in 176 lap.	22	0	0	0	Oil line to camshaft faied in 49 lap. Out.
					23	3	1	4.30	One driver change, Ford to Ellingboe. One tire change and one stop for water, gasoline and oil.
					24	4	1	34.45	A broken steering knuckle caused a 23.15 delay and a throttle adjustment one of 5 minutes. Fouled plugs brought the car in twice on the last call, 9 being used. A broken valve blasted all hopes in the 107 round.
9	3	1	19.30	Pressure line trouble and water supply responsible for one stop. Removing tail piece and changing drivers accounted for another. The third was for a complete tire replacement.	27	3	2	4.10	Routine stops for fuel, oil, gas and tire. One change of mechanics. Out in 133 lap with broken connecting rod bearing.
					28	1	0	2.00	One stop for gasoline and oil. Melting of solder on ignition connections forced withdrawal in the 87 lap.
10	0	0	0	Out in 22 lap with broken connecting rod bearing.					

shaft had been made to meet it. Front axles likewise justified the faith reposed in them, standing up to the work perfectly on every car.

Considerable trouble was experienced with shock absorbers, a number of stops being necessary to tighten up or replace some seemingly fragile parts. Perhaps the most heartbreaking experience was that of Jean Chassagne who, on the 64th lap, had the misfortune to lose the bonnet from his car. By the A. A. A. rules he was allowed one lap in which to recover it. This ruling he took advantage of but upon picking up the missing part, he found it be to so badly misshapen, twisted and crushed that it could not be again fitted to his mount.

The resourceful driver then procured a hood from another car which had been previously put out of the running and attempted to make it serve. However, it was much too big and long so that all efforts to fit it proved futile. Had it been permitted, the plucky racer would have gone ahead with or even without it. This he was not allowed to do as the insecure part would have proven dangerous to the other drivers and by the rules, all parts must be retained. So with his Peugeot running perfectly and with a splendid chance to come within the winnings, he was forced to abandon the race and remove the car from the pits and track.

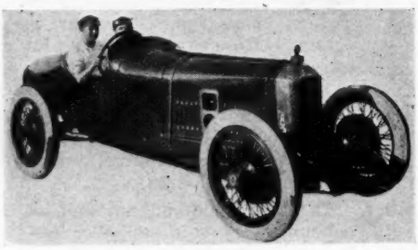
Another foreign contender, Andre Boillott, piloting a Talbot-Darracq, also came to grief early in the race when a connecting rod bearing broke in the 41st lap. After a valiant pit battle against fate, he also was compelled to bow to circumstance and push his car from the course. Despite the heat and the hot pace set in the early laps, the cooling systems behaved very well, comparatively few stops being made for water only. An unfortunate exception to the rule eliminated the English Sunbeams driven by Rene Thomas when, after making a splendidly consistent run, a water connection proved unequal to the strain and breaking, retired the entry.

IMPROVEMENT BY TEST

Some few stops were made to change drivers or mechanicians and one for no other reason than that the driver had become parched and was compelled to stop for a drink of water. After the first 300 laps had been negotiated, stops for gasoline and oil became somewhat frequent. It was at these times that the precautionary tire replacements were made. As has been many times mentioned in the columns of MOTOR AGE the gruelling distance speed contests on the fast tracks of the world are not entirely sporting events. They are the final tests of highly ingenious mechanisms which their designers and builders honestly believe to be the best automotive creations the world has ever seen.

Firm in this faith, they gladly submit the fruits of their genious to what actually amounts to a destruction test in order that those weaknesses unavoidably inherent in any man made machine may be detected and eliminated. So the struggle of human ingenuity against time, space and gravity goes on from year to year, the improvement in the product of each succeeding cycle more than justifying the time, labor and expense expended in proving the correctness or fallacy of the designers' theories.

This and the race of 1920 have, for instance, gone a long way to establish the 183 cu. in. straight eight engine in the favor of the motoring public. Years



Wilcox's Puegeot was the first car to get out of the race. A broken connecting rod was the cause

of research and thousands of miles of road testing would be required to determine the worthlessness or excellence of a design were it not for the quicker, more satisfactory method of the 500 mile race wherein the gold is separated from the dross in the crucible of white hot competition. And, while it is true that it is in the terrific, destructive drive that weaknesses are developed, it is in the pits that they are discovered and studied.

So the pits are actually outdoor research laboratories rather than a place to accomplish makeshift repairs. It is to be hoped that with the passage of time they will become even more than this; that they will become an active force in the training of the automotive service man of the future. For, within their confines is to be found the very essence of automotive service.

The unspoken slogan is "find it, fix it right and get the car back into service quickly," and this without the thought of immediate reward entering too strongly. That an adequate reward follows is as true as that it follows true service wherever rendered. Of all the lessons taught by this, the greatest of the 500 mile races, there are none more valuable than those of the pits and of those without question the most valuable are to render service to the best of your ability and, in order that you may do so without dissipating energy and wasting time in lost motion make as close a study of your work as do the pit mechanics, provide proven labor saving tools of good quality and when they have been provided, institute a rigid rule of "a place for everything and everything in its place." To the great intelligent body of the automotive service men of America this is the 1921 message of the pits.

A WORD PICTURE OF THE BIG RACE

(Continued from page 10)

2:18—Milton is leading easily and making no attempt to open any wider the gap between himself and Sarles. Thomas, the Sunbeam mainstay, is out with a broken water connection.

2:32—100 miles to go and Sarles is starting to push his Duesenberg in an effort to get on even terms with Milton. But Milton is reeling laps off at the rate of 1:36 4-5, which is about 93 m.p.h. One minute and 21 seconds separate the two. Both Murphy and Haibe have picked up one of the laps that separate them from Milton and are now only 9 laps behind. Percy Ford is 8 laps behind and holding his position easily.

2:39—Milton passes 425 miles going 89.58 m.p.h. His time is 4:44:39.88. Slowly he is increasing his lead over Sarles, leading him now one minute 25 seconds. The others are touring the track, content to hold their positions.

3:04—Only 20 laps to go, and the average steadily drops. Time for the 450 miles is 5:01:58.70, an average of 89.41. For the same distance last year the average stood at 90.44. Milton slowly increases his lead over Sarles, leading him now by one minute 45 seconds. Sarles has little chance of catching Milton and seems to be satisfied to keep the lead he has over Percy Ford, now running third, some 7 laps behind him. Murphy and Haibe change places though neither is a serious contender for first honors, barring accident.

3:10—The nine survivors, if nine survive, and that many are now running, will divide the prize that would have gone to the tenth. These nine are Milton, Sarles, Ford, Haibe, Murphy, Guyot, Hill, Vail and Mulford.

3:20—Milton is again pushing his mount and the average climbs a little. It stands now, at the 475-mile mark, at 89.75 m.p.h., as compared with 89.31 last year, and Milton's time is 5:17:34.91. Milton is now $5,700 to the good in lap prizes, he and De Palma having taken the lion's share of these.

3:23—Louis Chevrolet appears on the track. Calm, content and a broad smile fight for supremacy on his face. Milton's got it, that's a cinch. The Frontenac's **there.**

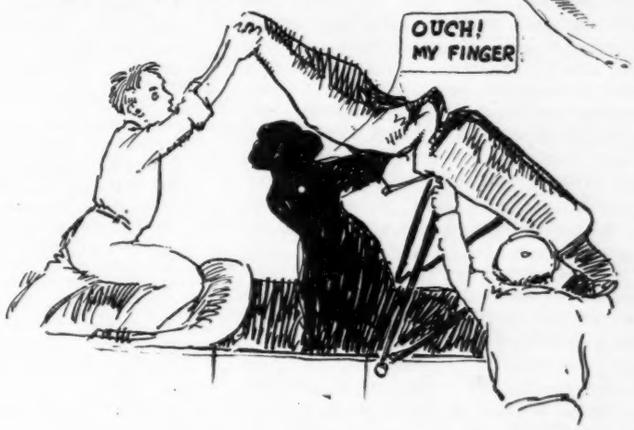
3:30—As the end approaches, Milton still further increases his speed and with but a few laps to go leads Sarles by 3 minutes 2 seconds. The stands are restless and the groaning rails hold back the surging crowd.

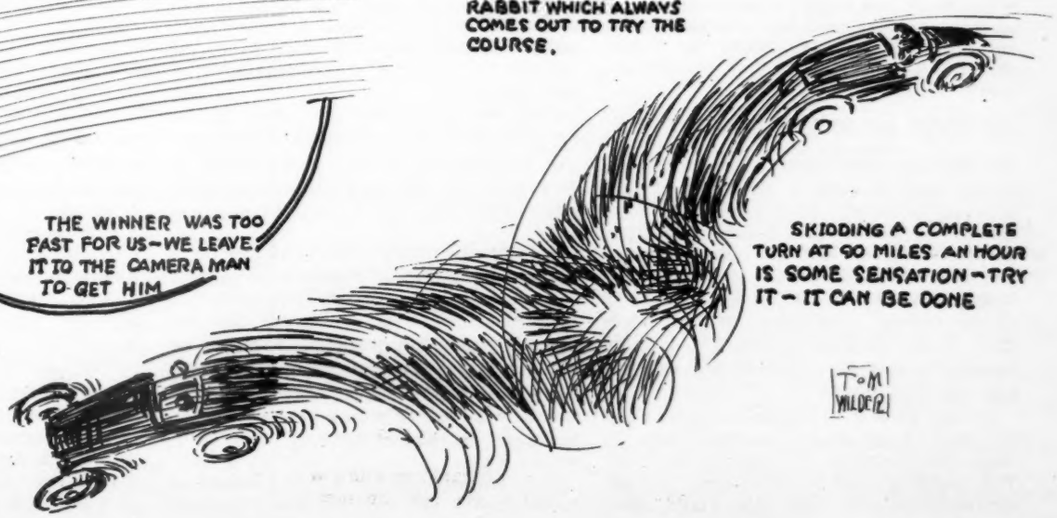
3:33—Two laps to go. Milton slides by all smiles. Sarles is taking it easy. The others are hurrying, hurrying, hoping perhaps that something may happen to push them a little higher on the winning list.

3:35—One lap more. All about the great infield cars begin to cough and spit. Having acclaimed a winner the crowd is anxious to be among the homebound dust.

3:36—MILTON WINS! His average is 89.62—his time 5:34:44.65. And for lap prizes he carries away $6,200, to say nothing of the first prize of $20,000, and not overlooking the equipment prizes, a grand total in the neighborhood of $36,000. Not a bad day's work.

The MOTOR AGE *Art Department Staff Saw Many Humorous Situations at the Indianapolis Race—but Going Home Monday Night—Well—That Wasn't So Humorous*





Methods of Paying Salesmen

Drawing Accounts
Rates of Pay for Salesmen
The Point and Bonus System
Keeping Sales Rivalry Keen
Commission on Repeat Business
When to Pay Men

METHODS of paying salesmen vary among different dealers and according to the custom in the locality where the dealer may be doing business.

In general, there are four accepted methods, each one of which has certain advantages and disadvantages. These four are as follows: (1) Straight salary. (2) Straight commission. (3) Commission against a drawing account. (4) A combination of salary and commission.

The method chosen will depend to a very great extent upon the ability of the salesman and how well he is known to his employer. Some salesmen prefer a straight salary, but in adopting this plan it is imperative that the dealer be very sure of the abilities of the salesman and very careful in his control of the salesman's activities.

In general, if a man works well enough to warrant receiving a straight salary he will generally earn considerable more than he is paid unless his salary is higher than ordinarily is paid to men in his class, and for this reason he will be dissatisfied.

On the other hand, if he is working on a straight commission and really is working hard, but because of trade conditions or other reasons beyond his control is unable to close a sufficient volume of business to give him a living wage, he is just as apt to be discontented and to consider that his efforts in representing the dealer should be worth something, even though they are not directly responsible for sales.

BEWARE OF DRAWING ACCOUNTS

What has been said with regard to salary applies also in the case of the drawing account. If a man is a conscientious worker and brings in a fair volume of trade he will have no need for a drawing account. On the other hand, assuming he is working as hard as he should, conditions may be such that he is temporarily prevented from turning in enough orders to pay his living expenses.

In this case it is manifestly unfair on the part of the dealer to expect him to work for nothing, or next to nothing. The dealer should assume some part of the responsibility and this would take the form of a drawing account to tide the salesman over his unhappy period.

In some cases the combination of both salary and commission works out well. Where such a plan has been adopted it has been found best to give the salesman a small salary which is looked upon not as remuneration for sales effort but as pay for being the representative of the dealer.

Pay for sales effort is given in the form of a small commission. Obviously, the commission in this case would be less than in the case of the salesman who is working on a straight commission.

RATES OF PAY FOR SALESMEN

The rate of pay of salesmen is largely a matter for the tire dealer to decide for himself. It is customary for the dealer to pay his salesman working on a commission basis, 5 per cent of the net amount of sales of new tires and new tubes and anything from 10 to 20 per cent on the net amount of sales of repair work.

It is not advisable to allow a salesman more than 5 per cent on new tires and tubes. If he is given more it will reduce the dealer's margin of profit by too great an amount; it may result in making the salesman lazy ,particularly where he is selling to a clientele using the larger sizes of tires. Similarly it is unfair to the salesman to expect him to work at a lower rate of commission.

Where a combination of salary and commission is used, it is fairly general practice to allow a salary of somewhere in the neighborhood of $20 a week, depending upon the cost of living in the particular locality. Coupled with this is a commission of approximately 2 per cent. Under this arrangement the salesman who has no extensive family obligations is just about able to get by on his salary. At the same time, his earnings will be in direct proportion to his efforts. His commissions on sales will be velvet.

THE POINT AND BONUS SYSTEM

Still another method of paying salesmen and one which has been found to work out with considerable satisfaction both to the dealer and to the salesman is what may be termed the point and bonus system combined with a salary and commission. Under this plan the dealer establishes a unit of sales, such a unit being made to correspond to one point.

For example, let us suppose that the dealer establishes $5 as being the sales value of one point. Then if the salesman sells a tire which nets the dealer $50, the salesman has earned 10 points. If the dealer establishes a sales quota for the week to say 80 points, with a bonus of perhaps 2 per cent on each point in excess of the 80 points earned during the week, he will have given the salesman an additional incentive.

Working on a basis of the figures just mentioned, it would be necessary for the salesman to sell $400 worth of tires in a week in order to earn his salary of $20. If he sells $1000 worth of tires, he will have exceeded his quota of $400 by $600 or 30 points. On these 30 points he would be entitled to an additional commission of 2 per cent or $12, making his total remuneration for the week $44. That is, 2 per cent of $400 or $20, plus 2 per cent of $600, or $12, plus a bonus of 2 per cent on $600, or $12 additional.

For Every Dealer

NO reader of MOTOR AGE who now operates or contemplates operating a tire business either as a separate business or as part of his service organization can afford to miss any part of this series.

The compelling motive behind the preparation of these articles is the regrettable lack of accurate information and helpful guidance having to do with tire merchandising and repairing. The subjects explained are:

3—Handling the Sales Force
4—Letters and Post-Cards
5—Advertising
6—Window Displays
7—Salesroom and Office
8—Service Station Facilities
9—The Service Station
10—The Service Car and Its Equipment
11—The Repair Department
12—Equipping a Shop
13—Tube Repairing
14—Fabric Tire Repair

A system of this kind is particularly valuable where a number of salesmen are employed. It gives to each the incentive to beat the others and in this way works not alone to the advantage of the dealer but to the advantage of the salesmen themselves.

KEEP SALES RIVALRY KEEN

It is an excellent plan to keep an accurate record of the sales of each individual salesman at all times and for this purpose there is nothing better than an ordinary black-board.

The use of a black-board keeps sales rivalry keen and this should always be the object of the dealer. Keep the salesmen always on their toes; don't allow them to become discouraged. Talk to them like a "Dutch-uncle" if neecssary but see that they leave the salesroom every morning full of "pep" and enthusiasm, with determination to beat yesterday's record.

WHEN TO PAY SALESMEN

Salesmen should be paid for their work as soon after the performance of the work as is humanly possible. There is nothing so discouraging to a man as when he is compelled to wait for the money he has earned and which is rightfully his. For this reason the dealer should never fail to settle with each salesman at the end of each week. Never let settlements drag over from one week to another. Settle each at once.

The dealer should pay his salesmen at the end of the week the commissions representing the total volume of business turned in during the week regardless of whether that business has been actually paid for by the customer or not. In other words, the salesman should be paid even though the merchandise has not been paid for by the purchaser but is carried on open account by the dealer and settled for at the end of the month.

This is the most satisfactory way for both the dealer and the salesman. Some dealers prefer to hold the salesman off until after the customer has paid his bill. This is poor practice. It engenders dissatisfaction. No plan is superior to the plan of paying the salesman weekly on the business actually obtained during the week.

PAY ON REPEAT BUSINESS

Salesmen should be paid on repeat business. A customer should be considered a salesman's customer as long as he deals with the house but with certain limitations. It is the practice among many dealers to allow salesmen commissions on repeat business up to an arbitrary amount which is generally in the neighborhood of $500.

In other words, the salesman continues to draw a commission from a customer until that customer has bought $500 worth of merchandise. After that the salesman loses his claim over the customer whose business then reverts to the house exclusively.

This allows a salesman to build up a certain trade upon which he can live in temporary periods of depression. But the limitation of the amount of business on which he can draw renewal commissions, if they may be termed that, prevents him from taking advantage of the house.

It is a mistake for the dealer to imagine that a salesman is making too much money if he is regularly drawing $100 a week or more on commission. It would be a fatal mistake on the part of the dealer to reduce the rate of commission. The more the salesman earns the more the house profits.

Next Week—Business Pulling Letters and Postcards

THE BLANK TIRE CO.

CONDITIONAL SALE AGREEMENT

STATE OF .....
COUNTY OF ..... ss.:

This agreement, made this day of , 19....., between The Blank Tire Co., Inc., hereinafter called the Seller, party of the first part, and of Street, Conn., hereinafter called the Purchaser, party of the second part:—

WITNESSETH: That the Seller, in consideration of payments and agreements herein set forth, has this day sold and delivered upon the following conditions to Purchaser, the goods hereinafter described.

Description	List Price	Discount	Net Price
Total Purchase Price			
Cash Payments			
Balance			

The Purchaser acknowledges receipt of the goods above described and agrees to pay the balance of the said purchase price in installments, as follows:.....

Date	Amount	Paid

A refund of ..... per cent of the purchase price will be allowed to the purchaser after the above payments are completed, provided they are met promptly on the dates specified.

It is provided that delivery of the above goods by the Seller to the Purchaser does not pass the title thereto, which shall be vested in Seller until the aforesaid amounts are fully paid.

Purchaser, until said Amount is paid in full by him, shall not sell, let, assign, encumber, or dispose of the goods without written consent of Seller; and Purchaser shall keep and maintain the goods in good order and repair. Purchaser shall keep the goods free of all liens, taxes and charges.

Upon any default by Purchaser in the conditions or covenants of this agreement, Purchaser shall on demand by Seller forthwith deliver the goods to Seller in as good condition as when received by Purchaser, ordinary wear and tear excepted... Should Purchaser fail or refuse upon such demand to deliver the goods as aforesaid to Seller, Purchaser agrees that Seller shall have the right, without any further notice or demand, forthwith to take possession of the goods wherever found, and for such purpose Purchaser hereby authorizes Seller or his assignee to enter any premises of Purchaser, with or without force or process of law, and forthwith to take possession of the goods.

Seller may, at his option, by collection, suit, or otherwise, enforce payment of said Amount, and no suits or legal proceedings with respect thereto shall, however, be deemed any waiver of said right of seller to take possession on default or breach as aforesaid. If Seller shall take possession of the goods, and, upon a sale thereof, the proceeds are insufficient to cover the sum or sums remaining unpaid with respect to said Amount, and the expenses caused by such repossession, removal, reparation, storage, liens and sale, Purchaser agrees to pay any deficiency that may result, otherwise any overplus in excess of the amount necessary to cover said items shall be paid to Purchaser.

Purchaser acknowledges receipt from Seller of a true copy of this agreement.

The Purchaser says that he resides at and that there are no judgments against him in any Court, nor are there any replevins, attachments or executions issued against him now in force, nor has any petition in bankruptcy been filed by or against him, and that these statements are made for the purpose and with the intent of inducing the Blank Tire Co., Inc., to sell the property herein above described to the Purchaser on credit.

The Purchaser further and for the same purpose deposes and says that the following is a true statement of his assets as of this date:—

Bank Account	Automobile .....
Real Estate	Life Insurance .....
Personal Property	Other Property .....

IN WITNESS WHEREOF, Seller and Purchaser have duly executed this agreement and hereunto affixed their seals in duplicate, on the day and year first above written.

..... (Seal)
(Purchaser sign here)

By .....

..... (Seal)
(Seller sign here)

STATE OF.....
COUNTY OF..... ss.:

On this day of , before me came to me known to be the person described in, and who executed the foregoing instrument, and acknowledged that he executed the same.

STATE OF.....
COUNTY OF..... ss.:

On this day of , in the year before me came to me known, who, being by me duly sworn, did depose and say that he resides in ....., that he is the of The Blank Tire Co., Inc., the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal ffixed to said instrument is such corporate seal; that it was so affixed by order of the board of directors of said corporation, and that he signed his name thereto by like order.

Fig. 1—This contract form has been used quite successfully in selling tires on time. However, such a form should be drawn up by a lawyer and made to fit the laws in a particular state

EDITORIAL

The Race in Retrospection

NOW that the smoke has cleared away and the spectators have had time to get a night or two of healthy sleep and a few deep breaths the question will arise, does the big race mean anything? The answer is that it is the greatest educative force in the whole realm of motoring. On the one hand it proves to the designer whether his product is what he hoped it would be before the first evanescent glimmerings of his brain were even committed to paper.

Should the child of his creative genius come through the smashing competitive ordeal without evidencing congenital defects he feels justified in offering its modified counterpart to the motoring public with the assurance that it will carry his name to glory as certainly as would a well-born son or daughter. Should it fail to come up to his expectations he is the first to know wherein the weakness lies and accepting the lesson in good part, sets himself the task of strengthening and bettering his product.

Of no less value is the educative function of the long grind when viewed from the standpoint of the spectator. This for the reason that every one of him is the owner, actual or potential, of a motor car. Once having owned a machine he will never be without one and to him the race course is the proving ground of the efficiency and stamina of the car which he will purchase when his present one no longer meets his requirements.

Those cars in a big race which perform consistently, rolling up mile after mile without serious failure of vital parts, even though they may not finish up with the leaders, impress the onlooker favorably and implant in his mind a suggestion, from which he can never free himself, that, when the time comes to make the purchase, he investigate the stock models.

Assuming the risk involved in making a prophecy we predict that as a result of the well absorbed lessons of the recent race the coming season will be marked by an increasing demand for cars equipped with straight eight power plants. As a closing thought; how long would have been required to educate the public to this demand through the regular slow channels?

Getting Credit From Your Banker

NOW that the country banker is fairly well impressed through repeated declarations of the Federal Reserve Board and its district banks that there is no edict and never has been an edict against the acceptance of motor car paper. The dealer or distributor who needs funds to finance his sales must make further preparations for presenting himself before his own banker or the banker in the town where he does business so that his argument for a loan may break down the ultra conservative attitude which many of these bankers have assumed.

When Gov. Harding in his address at Kansas City said that it was incumbent upon dealers to exercise care in the preparation of their financial statements he was setting forth the gist of the whole thing. If the banker has money to advance and if he has in his hands an earnest statement, prepared with care to detail of the condition of the dealer's business he will find it difficult to combat the dealer's argument.

The importance of the automotive industry has been evidenced in its rapid recovery; it is pointing the way for all industry to a return to normalcy. In these times luxuries are not the first to lead industry back to a stable foundation. It is the necessities that lead the way and bankers in your town or in any other town cannot be blind to this fact.

Helping the Dealer Sell Tractors

DESPITE the disposition in some sections to be pessimistic over conditions in the tractor market there nevertheless is a pronounced feeling of optimism in many quarters, not segregated, not in any one part of the country and not among dealers who all handle one make of machine. There are dealers who have reported a healthy business during the past year and who state that they will sell fully as many tractors in the year that is about to open for tractor sales. These dealers, without exception, have a well defined merchandising policy. They know where to sell tractors and how to sell them. They know how to continue cooperation with the purchaser so that the tractor will yield a maximum profit.

The manufacturers doubtless know who these dealers are. They should go out into the field with them so that their optimism may bring in a 100 per cent return. They should bend their efforts toward bringing to a splendid fruition, at a time when from some quarters comes the report that the farmer must be re-educated on the value of the tractor, the hopes and plans of those dealers who say that their reports at the conclusion of this year's selling will be equal to that of the past year. They should avail themselves of the opportunity offered by the dealer's optimism.

The opening of the year for tractor sales is July. Figures indicate that early plowing—as soon as the small grain crop is harvested—will increase the subsequent crop 20 to 40 per cent. The tractor should be put into the hands of the farmers before the ground has had an opportunity to bake. They should be available for plowing then.

A certain tractor dealer makes it a practise of quoting a price on tractor disk harrow and plow and a few other pieces of equipment whenever asked about what the tractor sells for. The actual price of the tractor alone never is heard around his establishment, and as a result he sells more complete outfits than any other dealer in the surrounding territory.

Harding Meets Western Dealers

Governor of Federal Reserve Board Touring Middle West to Impart Information on Conditions Brings Cheerful Message to Representatives of Industry from Kansas City District

KANSAS CITY, May 28—W. P. G. Harding, governor of the Federal Reserve Board, touring the middle west, was the guest of the Kansas City Motor Car Dealers' Association, and during his day's visit held two conferences with directors of this association and representatives of the automotive industry from practically every state of the Tenth Federal Reserve district.

In the evening he was guest of honor at a banquet at the Hotel Muehlebach given by the dealers association, at which the visiting automotive men, bankers and leading business men of the district were present. John Butler, president of the association, presided.

Gov. Harding had spoken in Topeka before the Kansas Bankers' Association; and at the City Club in Kansas City. In both of these addresses he declared that the policy of the Federal reserve banks had not changed, but that methods were changing in adjustment of financing to altered conditions. On the one hand was the decline in the volume of loans and the decline in Federal note circulation, and on the other hand was the increase in cash reserves.

The splendid situation of the Federal reserve organization reflected a similar condition of satisfactory loaning ability in all member banks and other banking institutions. It was therefore no longer necessary for the Federal reserve banks and for member banks to decide whether an industry asking credit accommodations was more or less essential.

In his talks with the motor car dealers, and in his address at the banquet, Gov. Harding made the application to the automotive industry still more definite. He said that Federal reserve banks were now in strong position; that they always had had the disposition to assist all industries, and now they had the undoubted ability to do what they ought to do.

BANKER IS JUDGE

He qualified his statement with the remark that the individual member bank itself is the judge as to what it ought to do. In reviewing the service of the Federal reserve banks during the past two years, Gov. Harding laid heavy stress on its service to agriculture and live stock interests. These interests are requiring far more help this year than last year or the previous period. While loans generally have receded a billion dollars, there has been an increase in agricultural and live stock rediscounts.

The governor reflected the conviction of many automotive dealers when he said that all business in the territory realizes the need for careful nurture and help to agricultural and live stock production as basis for future general prosperity.

The governor also laid emphasis on the fact that the limit of rediscount facilities of any one bank with the Federal reserve bank was a minutely small volume of its total loaning ability. Any bank in the normal process of business would be lending a great many times more money than it could borrow from the Federal reserve. Every bank was bound to have a large amount of paper in its own portfolio which it had to carry without rediscounting and concerning which the Federal banks had no interest.

His specific message to the automotive industry of the district implied that motor car paper would probably be rediscounted in the Tenth reserve district. He declared that the automotive industry would realize their obligation to Gov. Miller and his associates, for the masterly manner in which this reserve bank had been handled.

Parenthetically it may be stated that many of the dealers expressed to Governor Harding during the conferences, their conviction that in many cases the attitude of the Federal reserve bank here had protected the interest of bankers and distributors both wholesale and retail, even though the industry may have suffered from the fact that motor paper had not been rediscounted during the long period.

FORMS MUST BE FOLLOWED

The implication that motor car paper was to be rediscounted, was clear, in Governor Harding's advice to dealers with reference to the preparation of forms in such manner that they could be handled expeditiously by the Federal reserve bank.

"I hope," he said, "that those who have objected to forms which they consider unnecessary annoyances will realize that there is reason for every requirement as to forms. You will save time if you meet these requirements and forget your objections."

Gov. Miller of the Federal reserve bank at Kansas City, provided the climax for the visit of Governor Harding, the conferences and the banquet, in a brief but pithy address at the evening meeting. He said: "There is a time for all things. Certainly there never was a time when such a meeting as this could have been held, certainly there has not been such a time in the past eighteen months. The Tenth district has more essential com-

(Continued on page 31.)

Liquidation Fairly Under Way

GOVERNOR W. P. G. HARDING of the Federal Reserve Board, Washington, D. C., is making a tour of the middle west. He is outlining the financial history of this country, through the period from Jan. 1, 1919, to date; and showing by charts that cash reserves of Federal reserve banks, and presumably of member banks, have risen until they have crossed the declining line of loans and that Federal reserve circulation is declining, and may soon also cross the line representing increasing cash reserves.

He is pointing out that wholesale prices have declined radically; that production both in raw materials and manufacture is practically on a readjusted level, and that there is no reason to expect other than consistent improvement in business.

Perhaps the most striking lesson his addresses are conveying to the automotive industry, is that liquidation is fairly well under way, and that the individual, the merchant, the business man in any line, can consistently proceed on a normal basis of buying since there is nothing in the financial situation to hinder him.

Gov. Harding is also declaring that there will be less scrutiny of paper hereafter, because the resources of banks enable them to lend more freely. They can lend, and the Federal reserve banks can rediscount, almost solely on the showing of the desirability of the paper, rather than on the need of the general public for the promotion of the industry borrowing.

A particular lesson for the automotive industry in the governor's addresses, is his insistence on careful accounting and preparation of statements for bankers on which loans may be asked

Olds Motor Works Not Closed Down; Dodge Shut Four Days

Former Curtailed Production Temporarily; Latter Interruption Due to Changing Tires

DETROIT, May 26—A rumor to the effect that Olds Motor Works had closed down was denied vigorously by A. B. C. Hardy, who succeeded Edward Ver Linden as president there last week. The rumor, Mr. Hardy said, originated from the fact that there had been some trouble with the rear axle as a result of which it was decided to change gears, necessitating curtailment of production to 20 cars a day for about 7 days. Production at the rate of 50 cars a day was resumed Wednesday and has been increased steadily since then in the hope of getting it to between 100 and 150 cars daily. The plant was building approximately 125 daily when the curtailment came a week ago Monday.

A similar report concerning Dodge plant growing out of the fact that the plant went down Wednesday night, brought the statement from President Haynes that the shutdown was for the balance of this week only, and that the factory would resume an uninterrupted daily schedule next Tuesday. Mr. Haynes declared the shut-down was due chiefly to the fact that the company is changing tires on its cars and has ordered one or two other improvements.

Will Operate Part Time

The report concerning Dodge was to the effect that the plant following the present shut-down would operate on a two or three day weekly basis. This Mr. Haynes declared, was not true, and while he could not foretell future plans, there was nothing to indicate any interruption to the continued daily production schedule as now planned and which would be entered upon Tuesday. Mr. Haynes also denied the company was laying off men at the rate of 50 a day, or that the force had been decreased to approximately 9,000. On the other hand, he said approximately 12,000 men were at work when the plant went down Wednesday.

Kenosha, Wis., May 28—Following a reduction of working schedules by the Nash Motors Co. to a basis of a full half-day six days a week, due to over-production, certain departments have been shut down temporarily pending improvement in the demand for cars. A statement by President Charles W. Nash says in part:

"We decided last week that it would be better to operate a full half-day each day and make 65 cars in the half-day than it would be try to carry this over a full day's work, due to the fact that it would be necessary to have reduced our working force materially if we attempted to operate all day; whereas if we operate a half-day we are able to give a great many more men employment.

"We have no definite date fixed when we may be compelled to close down for a short while entirely. This will be due entirely to the condition of the business throughout the country. Our dealer body had a considerable number of cars on hand, and the extreme cold, backward weather that we have been having all spring is not conducive to selling automobiles.

"Another thing: Some companies have been able to reduce their prices materially and this has upset in a measure the prospective buyers of Nash cars. My judgment is that if we should get some settled, warm weather, selling would take a new lease on life and business would go on to a considerable extent."

Draymen's Association Adopts Parts Servicing Resolutions

Los Angeles, May 26—The Southern California division of the Draymen's Association has adopted resolutions requesting manufacturers of complete unit parts to establish parts stations at which genuine parts can be purchased at fair and uniform prices for the units now being manufactured as well as those which are considered obsolete. This method, the resolution asserts, is the only practical way in which motor truck users can get the service to which they are entitled.

The assertion is made that past experience demonstrates that distributors and agents either cannot or will not carry a complete stock of parts. Another difficulty, it is stated, is that manufacturers are constantly changing their representatives as well as their models and that as a consequence members of the association constantly are finding themselves with broken down equipment because no one carries the parts needed.

Another resolution has been sent to the Motor Truck Manufacturers' Association protesting against opposition to the unit parts station proposal.

ESSANKAY PRODUCTS MOVE

Chicago, May 27—High rents, space shortage and lack of room for development are assigned as reasons for the removal of the Essankay Products Co., manufacturer of a tire filler, from automobile row to a frontage on South Park boulevard at Twenty-sixth street. This property will be used by the company for city sales department and offices. Other buildings will be erected in the rear for subsidiary companies which the company will control and which will manufacture various articles from their product.

DEALERS ON ROAD COMMITTEE

Philadelphia, May 27—The Philadelphia Chamber of Commerce has appointed the good roads committee for the current year as follows: G. Herbert Taylor, chairman, Eastern Motors Corp.; A. E. Moltoy, vice chairman, Guy A. Willey Motor Co.; Walter Y. Anthony, Packard Motor Car Co. of Philadelphia; Walter G. Herbert, Herbert Bros.; Andrew McBarney, Crew-Levick Co., and W. L. Plack.

Improved Sales Methods Among Truck Dealers to Be Discussed

Association of Managers Hear of Activities Not in Accord with Good Business

DETROIT, May 26—Directors of the National Association of Truck Sales Managers will meet June 7th to discuss improved sales methods among motor truck dealers and outline a plan of campaign, to bring about a better understanding. Fred Glover, general manager of the Timken-Detroit Axle Co. and G. W. Yeoman, vice president of the Continental Motors, will attend the meeting and address the directors. Many reports that have reached the association headquarters regarding the activities of some dealers not in accord with good business principles, resulted in the decision of the directors to make an effort to bring about betterment through persuasive methods if possible. In the event of failure, drastic measures will be taken it is said to bring such practices to an end.

The first fruits of the efforts of the employment bureau of the National Association, came this week with the arrest of G. L. Hanna, alias G. L. Williams, on a charge of obtaining money fraudulently by representing himself as authorized to sell service motor trucks with the guarantee of contract work on Ohio roads sufficient to permit the purchaser to earn the money to pay for his truck. Hanna formerly was connected with the Pierce-Arrow sales organization, and according to information from the Sales Managers' Association headquarters here he is wanted in Buffalo for purloining $655 received in deposits on cars. He also is said to have worked a scheme in Chicago similar to the one which caused his downfall here.

When he arrived in Detroit, Hanna had letterheads printed bearing the name of the "Atlas Portland Cement Co., road construction department." He advertised for men with trucks and also for truck drivers. His scheme according to association officials was to tell the driver who had no truck he could sell him a Service motor truck at a 30 per cent discount, and inasmuch as the finance companies demanded a 33 1/3 per cent down payment on the truck, the driver by paying the 33 1/3 per cent difference in cash would get his truck and pay the balance out of the earnings on a road contract in Ohio. By this method he is said to have secured several hundred dollars in deposits from drivers ranging from $10 to $20.

COLUMBUS HAS TIRE DIVISION

Columbus, May 28—The organization of a tire division of the Columbus Automotive Trade Association has been completed at a meeting attended by tire dealers and repair men not only from Columbus but also from central Ohio cities and towns. E. T. Paul was made chairman of the meeting. Permanent officers will be elected at a later meeting.

Rumors of Ford Closing Again Current; Officials Deny Them

Company Is Producing 4,000 Cars Daily and is 100,000 Behind In Orders

DETROIT, May 28—In face of persistent denial on the part of Ford officials, rumors that the big plant at Highland Park will close around July 1 persist and are accentuated by statements of some material men to the effect that they have been informed no contracts will be entered into for deliveries after that date.

Ford officials declare the demand is increasing for the company's product, and point to conditions in various parts of the United States and foreign countries in denial of rumors that the plant would close. The plant is maintaining production now at above 4,000 daily despite which the company is said to be over 100,000 cars behind in orders today.

Of the new cars registered in southern California, 2,820 of the 6,259 are Fords and conditions in that state, Ford officials say, never were better, and give promise of increasing steadily. This is true particularly of southern California which includes the ten lower counties and the city of Los Angeles.

Denmark Business Growing

The Copenhagen plant is turning out 30 cars a day and the latest information from Denmark is to the effect the outlook is excellent and business growing steadily. It is hoped the Baltic provinces and Russia will be opened up for Ford service shortly, and it is said heavy demand is assured in those territories.

The Ford Motor Co. of England is turning out a ton truck as a complete vehicle with the body ready for immediate service which gives facility of road delivery, provision for storing cars when making delivery and a reduced price which is encouraging sales in English territory, officials say. The demand in Scotland they say is brisk and touring cars particularly are being sold in large numbers.

To the same extent production has grown in the tractor end of the Rouge plant as shown in the monthly records. There were 2,057 Fordsons turned out in February, 2,784 in March and 5,625 in April. May production up to and including May 7 was 1,500 tractors. Production is at the rate of 250 daily.

Improved business is reported from the Canadian Ford plant and especially in eastern territories conditions are said to be considerably brighter. Fordson tractors shipped from the Rouge plant to the Ford Motor Co. in Ontario were distributed to farmers in the northwest provinces, in Ontario and in the east.

Normal output of cars was attained at the Canadian home plant last week and the full force now is in operation on full time, about 3,000 employees being at work. Demand, officials say, is greater than production. The situation regarding Ford products in Canada they say, parallels that in the United States.

"This is the peak of the automobile season," said W. R. Campbell, secretary of Ford of Canada. "There seems to be an extra demand for cars and we thought it best to take advantage of this demand and give our employees as much work as possible."

Despite these conditions, employees both in Detroit and Canada have been cautioned to "make hay while the sun shines and to practice thrift insofar as is advisable." Campbell said he thought business had seen most of the dark days, but said it was being urged upon men not to become imbued with the idea that everything is going to be rosy from now on. He said business would have to keep a close check on itself for some time to come.

California Oil Production For April Exceeds Old Record

Sacramento, May 28—With gasoline reduced two cents a gallon because of "over-production" and the reserve of the oil companies of California piling up from day to day, indications are there will be no such shortage of motor fuel as disrupted touring and business use of automobiles last summer.

April production by all California companies in April totaled 338,981 barrels a day, an increase of 1,298 barrels a day over March. Shipments were 300,877 barrels a day, an increase of 5.451 barrels a day over the preceding month. These figures of production establish a new record for the State. Fifty-eight new wells with an initial daily production of 18,470 barrels, were completed.

There are 595 active wells in California now, the largest number in ten years,, and with 148 new rigs erected during the month, the largest number in any month since July, 1910, development is more active than at any time in the last decade.

MOORE MOTOR HEADS ON TRIAL

St. Louis, May 26—C. B. Thomas, receiver of the bankrupt Moore Motor Vehicle Co., Danville, Ill., testified during the trial of five officers and a stock salesman of the company on the charge of using the United States mail to defraud in connection with the sale of stock in the company, that total claims against the company when he took charge amounted to $165,773.39 and that the sale of assets conducted by him aggregated $78.963.72. The appraised value of the assets prior to the sale was $136,026.51.

The buildings and land originally cost $85,000 and despite the fact that the firm installed a new lighting and water system at a cost of $5,000 and caused three and a half acres of concrete flooring to be laid were sold for $54,548.09.

The officers on trial are George L. Moore, Edward K. Gallagher, Albert C. Leonard, John F. Bichl, and James H. Vickers. J. W. Patt is the stock salesman.

Guide for Used Car Buyers in New York Promising Success

Book Is Placed on News-stands by Publication Committee of Dealers' Association

NEW YORK, June 1—The ten weeks' experiment of the Automobile Dealers' Association in publishing an official Used Car Buyers' Guide, which is sold on the newstands, has reached its fifth week with fair indications of success. About 1250 of the little books are being purchased every week and several score of inquiries, direct to the association, are resulting. In addition, while dealers cooperating in the service report that they are having very little trouble in disposing of used car stocks.

While the guide has the approval of the association, it is not published directly as an association activity, but is handled by the publication committee of the association and financed by 21 branch houses, distributors and dealers who are taking advertising space in its pages for announcement of their used car offerings.

The committee urges that cars be listed with the details as to their age and condition, and requires that where listings are made the price be stated. There are one or two advertisers running general advertising with no details as to the cars on hand, but these are the exceptions.

The book is distributed to newsdealers in the hotels, subway and elevated lines and other important places at 5 cents a copy. It retails at 10 cents.

All inquiries received by the association as a result of circulation of the book are mimeographed and sent to all the advertisers. Up to date a high percentage of the inquirers have bought used cars, indicating that when a man pays 10 cents for a book of this sort, he has an active intention of investing in an automobile.

With the idea of helping to stabilize used car practice in other cities, the committee decided to communicate with dealer associations elsewhere, offering them the opportunity to use the facilities of the local guide staff to publish similar books for their own community.

If other cities should decide to cooperate, there would be formed an interlocking chain of cooperative used car buyers' guides for the purpose of stabilizing prices and general conditions in the used car market.

RECEIVER FOR BODY COMPANY

Detroit, May 26—The Security Trust Co. has been named receiver for the Detroit Weatherproof Body Co. with a factory at Corunna, Mich., pending sale of the property. The action is a friendly suit brought by the Michigan Steel & Metal Co. The body company has liabilities of approximately $650,000 and assets estimated at present market value to be worth $200,000. They consist chiefly of materials which actually cost about $700,000.

Durant Acquires Sheridan; Incorporates in Michigan

General Motors Denies Reports of Proposed Sale of Plants Not Automotive

NEW YORK, May 26—Developments came rapidly yesterday in the affairs of Durant Motors, Inc. The two most important were:

That Durant has acquired a controlling interest in the Sheridan Motor Car division of the General Motors Corp.

That the main Durant factory will be located in Lansing and will be under the direction of Edward Ver Linden.

The first formal statement in reference to Sheridan came from the headquarters of General Motors. It said:

"Arrangements have been made by the General Motors Corp. whereby D. A. Burke will purchase the Sheridan Motor Car division and continue it as a separate line."

This announcement brought from the Durant offices the statement that Durant Motors, Inc., had acquired the controlling interest in the Sheridan Motor Car division and that it would be conducted by a $3,000,000 corporation which probably would be known as the Sheridan Motor Car Co. Production will be continued in the factory at Muncie of a six cylinder car which will be virtually identical with the Sheridan now being made for the General Motors Corp. It is understood that the consideration was in the neighborhood of $5,000,000.

Burke, who spent many months in developing the car, will continue at the head of the company under the new ownership. He formerly was Buick distributor in Chicago and sold Durant on the idea of turning out at a moderate price a car embodying most of the refinements usually found in higher priced models.

Production began only a few months ago and much attention has been paid of late to building up a dealer organization. One of the prominent distributors selected was Eddie Rickenbacker, famed as an aviator.

This statement was made in reference to the main Durant plant:

"Durant Motors of Michigan, with a capital of $5,000,000, will have its main plant at Lansing, Michigan, with a capacity of 40,000 cars a year. E. Ver Linden, who has been responsible for the building up of the Olds Motor Works, will be president and general manager. The plant will assemble and distribute Durant cars between the Adirondacks and the Rocky Mountains under contract and control of Durant Motors, Inc."

The report is not denied that T. W. Warner, head of the Muncie Products division of General Motors, soon will relinquish his position to join forces with Durant. His retirement is not expected to involve any change in the present ownership of Muncie Products. The plant of the T. W. Warner company at Muncie, Ind., was acquired under lease by General Motors during 1919 with option to purchase after Jan. 1, 1923. Warner also heads the Toledo-Chevrolet Co. which manufactures transmissions.

F. L. Klingensmith, former general manager for Henry Ford, who now heads the Gray Motor Co., declines to deny reports that he will be associated with Durant with the Gray company as a unit of the Durant organization. He asserts, however, that his company will be in the market at the end of the year with its own car.

R. H. Collins, former president of the Cadillac company, now is spending all his time in the main building of the old Cadillac plant which was purchased from the General Motors Corp. for the Collins Motor Car Co., now being organized. The portion of the former Cadillac plant purchased by Collins contains more than 300,000 sq. ft. of floor space. He also has an option on the long building adjoining the main plant.

There is reason to believe that when production actually is begun by Collins and Ver Linden they will add to their organizations several of the men who served under them in executive capacities at the Cadillac and Olds divisions of General Motors. It also is understood that Durant already has opened negotiations with some of the most successful distributors of the General Motors Corp.

New York, May 26—Announcement was made yesterday by the General Motors Corp. that there is no truth in the reports that it proposes to sell the Frigidaire Corp., the Sunnyhome Electric Co. and other units not directly connected with automotive products. On the contrary, the sales of the Frigidaire refrigerator will be extended through the sales organization of the Delco-Light Co. of Dayton. The Sunnyhome company will be consolidated with the Delco company. Both of them manufacture light systems but there are considerable mechanical differences between them. Sale of the Frigidaire through the Delco sales organization is considered logical because the refrigerator is electrically operated and is attached to a Delco generator.

It is understood to be the intention of General Motors to continue operation of all three plants for the present at least. Both the Frigidaire and Sunnyhome are located in Detroit.

LOWER CHALMERS PRICES

Detroit, May 27—The following price reduction has been announced by General Sales Manager A. E. Barker on Chalmers cars: Five-passenger touring from $1795 to $1545; five-passenger roadster, $1795 to $1495; seven-passenger touring, $1945 to $1795; five-passenger sport, $1995 to $1695; coupe, $2575 to $2295; sedan, 2745 to $2445; all prices f. o. b. Detroit.

CROW ELKHART REDUCES

Elkhart, Ind., May 30—The Crow-Elkhart Motor Corp. has reduced prices $200 on its models and has guaranteed the new prices against further decline until Oct. 1.

Ace Truck Manufacturer to Handle Sales From Factory

Under New Selling Policy Zone Offices Will be Established Gradually

NEWARK, OHIO, June 1—The American Motor Truck Co., manufacturer of the Ace truck, has eliminated distributors and dealers from its selling plan and hereafter will distribute its product direct from the factory to the user through a system of zone offices. Coincident with the change of policy, the company has announced a reduction of $455, or 16½ per cent, on the 1½ ton model and of $655, or 23½ per cent, on the 2½ ton model. The new prices are $2295 on the 1½ ton and $2795 on the 2½ ton.

The new Ace plan, originated by C. L. Bowler, general manager, was first tried out beginning Feb. 1. In 10 days in three zones where the test was made 396 garagemen were retained to handle the service work and these garagemen, operating on a basis whereby they will be paid $150 each for names of prospects who later buy trucks, turned in more than 1400 prospects. Up to date 14 zone managers, recruited from the ranks of factory and distributor sales representatives of various truck lines, have been appointed and it is planned now to develop the new selling system on a national scale under the direction of Glenn B. Hiller, who became general sales manager May 1. Hiller formerly was general sales manager of the Nelson Motor Truck Co. and later assistant general manager and director of sales and advertising of the Triangle Motor Truck Co.

The Ace will develop new selling zones gradually by sections throughout the country, eventually, according to the present plan, having between 200 and 300. In each will be a zone manager in charge of sales and service, a zone service supervisor and as many salesmen and traveling service men as are necessary. The zone managers and their assistants will all be factory employees, those in the sales department working on commissions with drawing accounts. It is planned in each territory to have a central parts depot or two or three if necessary, and 200 or more service stations handling monthly inspections of all Ace trucks in the territory and doing necessary repair work. These service stations will also obtain prospects for new truck sales. They will be allowed $150 on each prospect who later buys and they will be permitted to get the cooperation of drivers and others to obtain prospects, in which case $50 of the $150 will go to the tipster. Selling will be handled exclusively by the zone manager and his salesmen. Service stations will make no investment in parts, obtaining these as needed from the zone parts depot, which it is expected in most cases will be not more than 25 miles distant.

Seasonal Decline In Demand Bound Up In Price Reductions

Buying Public No Longer Takes Into Account Cuts Made Last Fall—Stabilization Needed

NEW YORK, May 26—The usual seasonal decline in demand coupled with price uncertainties has resulted in a falling off in retail sales which has caused motor car manufacturers to proceed cautiously in making commitments for materials. In this respect they are following out the policy adopted months ago of producing only enough vehicles to fill actual orders. This condition is disclosed in reports made by the leading parts manufacturers of the country.

The total of business for May probably will equal that of April but it was heavier for the first two weeks than for the first half of last month. Since that time many releases have been countermanded and there have been a few cancellations of new orders. Indications now are that the volume of business for June will not equal this month. A considerable number of June releases have been help up in the last ten days.

Collections at Best Now

While orders for supplies are showing a tendency to decline, however, collections for May have been better than at any time since the slump began. The gratifying improvement recorded in April has continued and in numberless cases past due accounts have been liquidated. There has been heavy liquidation in the last three months in the current indebtedness of automobile manufacturers and there is no evidence that payment of obligations in future will be any less prompt.

Although parts makers have felt a slowing up in business from vehicle manufacturers, there has been no slump whatever in the trade with jobbers and wholesalers. In fact, it has steadily continued its upward trend and June promises to be better than May. Collections in this branch of the trade are excellent.

It is evident car and truck makers are determined not to pile up inventories. The experience of last summer in this direction has made them exceedingly wary. They are buying on a hand to mouth basis to meet only immediate needs. The falling off in orders from them is bound up closely in the question of price cuts.

Lines which have not cut have suffered a sharp decline in sales while those which have made reductions this spring have felt a marked rebound. The buying public seems to take no further account of price reductions made last fall. The market is decidedly jumpy and gives every evidence of needing the stabilizing influence which would come with immediate determination by manufacturers regarding what course they are going to pursue on the question of prices. Definite and positive announcements in this respect are needed, parts makers and dealers believe.

Even those watching the situation most closely are uncertain about what the next few weeks will bring in the way of business. Conditions are so topsy-turvy there seems to be no precedents to be followed in making preparations. As a consequence caution is being exercised all along the line in the manufacturing end of the industry. There is no pessimism, however, and the general feeling is that the present decline in business is partly seasonal and partly due to the uncertainty about prices.

Akron, May 26—An official statement issued by the Goodyear Tire & Rubber Co. now in control of the banking syndicate which refinanced it says:

Spring Spurt Receding

"The seasonal spring spurt of the automobile industry has settled back to a less active situation and curtailment of production of automobiles and parts, including tires, seems likely at once. Already 2,000 men have been laid off in one of the large automobile centers and similar action in the tire industry is probable unless conditions change sharply."

No definite information has been given out concerning the Goodyear production plans but there probably will be a reduction in the number of employees. Men will be laid off in the reverse of the order in which they were taken on in the spring, but merit and service will be given due consideration.

"We are sending out inquiries as to where men are wanted and efforts will be made to steer the men now laid off to these jobs," said the statement.

Goodyear had reached a production of 19,000 tires a day and re-employed nearly 4,000 men since March. Other rubber companies in Akron which also have increased production and re-employed several thousand men have begun to reduce their forces and to cut down production.

Davis Made and Sold More Cars This April Than Last

Richmond, Ind., May 26—The George W. Davis Motor Car Co. produced and sold more cars in April 1921 than in April 1920, according to Walter C. Davis, secretary and salesmanager. Production this year exceeds that for the same month last year by 9 per cent, and the factory is working at its full production schedule. The new roadster and the special roadster, which has been named the "Man o' War," have met with a very gratifying reception. The demand for the two closed cars, the sedan and coupe, is gaining steadily.

NASH CAPITAL FOR LAFAYETTE?

Kenosha, Wis., May 28—Charles W. Nash refused either to confirm or deny persistent reports that the Nash Motors Co. would acquire a substantial interest in Lafayette Motors Co. of Indianapolis. Nash himself is president of Lafayette Motors and has a large personal interest in that company.

Seek Governor's Veto to Ohio Bill on Weight of Truck Loads

State Association Aroused By Measure Limiting Carriers to 20,000 Pounds

COLUMBUS, May 28—Vigorous protests against substitute Senate Bill No. 34, which limits the weight of trucks on the streets and roads of the state to 20,000 pounds, were made at a joint meeting of the Columbus Automotive Trade Association and the Columbus Association of Commercial Haulers. Y. B. Jones, chairman of the truck division of the former association, presided and more than 100 men vitally interested attended. Several speakers announced that the limit of 20,000 pounds would cut down the normal load on the usual five ton truck where it would not be profitable to operate.

E. J. Shover, manager of the Ohio association gave a history of the bill from its inception, claiming that no opportunity was given at a public hearing to discuss the substitute. He said that last year one-half of the transportation was by trucks and the enforcement of the law would seriously hamper motor transportation in the state. W. W. Williams, a truck salesman, called attention to the great importance of truck transportation while Leon C. Herrick, Ohio highway commissioner, said the roads should be built for trucks and not the trucks for the roads.

The fight is to secure a veto of the substitute bill by Gov. Harry L. Davis, and to that end delegates from Cincinnati, Dayton, Toledo, Cleveland and other Ohio cities will join with the committee from the local organization in protesting. Hundreds of letter of protest have been sent to the governor and pressure is being brought to bear from every source. It is pointed out that five-ton trucks are used for hauling milk, cattle, hogs, sheep, grain, and in fact all products of the farm. Trucks belonging to the different subdivisions of the state and even the Ohio Highway Commission can not be operated to capacity under the law. It was pointed out that New York permits 25,000 pounds; Pennsylvania 26,000 pounds; New Jersey 30,000 pounds; Connecticut 25,000 pounds, gross weight of vehicle and load. Under the present law only 24,000 pounds is permitted and under the new law which will become effective with the signature of the governor, 20,000 pounds.

WILMINGTON DEALER DIES

Wilmington, Del., May 26—Word has been received here of the death in Reading, Pa., of John V. Cummings, a former automobile dealer in Wilmington, as the result of a railroad accident. When located in Wilmington Mr. Cummings was with the Fader Motor Co., later becoming local dealer for the Velie and Scripps-Booth lines.

Willys-Overland Reduces Indebtedness During Year

Business of Company Has Increased Steadily Since January, President Informs Stockholders

NEW YORK, May 28—The facts that made it necessary for the Willys-Overland Co. to ask for extension of its bank loans in 1920 were revealed in the annual report of the company. This showed, however, that important progress had been made in marking down current liabilities, as that item at the close of last year stood at $28,868,386, compared with $42,519,660 at the end of 1919.

Notes payable, including bank loans of $20,985,900, totaled $24,288,653 on Dec. 31 last, contrasted with $30,360,000 the corresponding date of the previous year. Inventories were reduced in the two-year period from $38,716,624 to $35,309,825. As regards the company's bank loans bankers state that since the first of the year a further reduction has been accomplished.

Surplus Account Adjusted

Net earnings of the company for 1920, after deducting repairs and maintenance of the properties and bad and doubtful accounts, but before deducting adjustment of inventories to market value and losses on investments in affiliated companies were $8,822,152. From this was deducted $2,114,243 for interest, $3,768,264 as reserve for accruing renewals, depreciation and provision for tool replacements, leaving a balance of $2,939,644.

After allowing for preferred dividend required there remained a surplus for the $56,146,675 common stock $25 par value of $1,750,934, equal to 77 cents a share. This compared with $2.26 a share earned in 1919. After payment of the dividends on both classes of stock there was an actual deficit of $173,166.

In a letter to stockholders accompanying the report John N. Willys, president, explained that the company's surplus account has been adjusted through the application of extensive depreciation and reserve items on inventory and material accounts.

"It is believed," Willys stated, "that the reserves and depreciation thus taken are sufficient to place the company in a satisfactory operating condition. The effect of the application of reserves and depreciation provided against inventories and materials is to place the company's whole inventory and forward commitments upon the basis of low current market replacement values. In addition to the reserves and depreciation thus taken, a depreciation of $6,931,693 has been taken on investments in affiliated companies, the total of all depreciation and reserves being $26,101,711.

"Readjustment of the company's plant account has been made on the basis of 20 per cent less than the actual sound value determined by the American Appraisal Co. Branch house properties are carried at their book value, $5,961,811, whereas a recent valuation gives these properties a sound value of approximately $10,000,000."

Mr. Willys said the business of the company had increased steadily since the first of the year, resulting in a substantial liquidation and a betterment of cash position. The company's total indebtedness on May 1, he said, was approximately $20,000,000 less than on the corresponding date a year ago.

GREATER SCHEDULE FOLLOWS CUT

Toledo, May 28—Following the announcement in price cuts of Overland and Willys-Knight cars, a notice has been issued that the Willys-Overland plant in this city will increase its production 50 per cent in June over the month of May.

Maxwell-Chalmers Branch on Coast Will Handle All Sales

Portland, Ore., May 28—Expansion of the Maxwell-Chalmers organization in this city, following the recent action of the Maxwell-Chalmers in establishing a branch for the Pacific northwest here, was announced this week by T. R. Harrington, branch manager. Portland had already been the location of a Maxwell branch handling parts only.

Under the new arrangement the local branch will wholesale both Maxwell and Chalmers cars for the entire Pacific northwest, and will retail the cars in the Portland territory. The branch will also handle Chalmers parts for the northwest and Maxwell parts for the entire Pacific coast. In order to take care of this greater burden of business the branch is being considerably enlarged and a much more complete supply of parts for both Chalmers and Maxwell cars is being secured from the factory.

NASH BRINGS OUT NEW TRUCK

Kenosha, May. 26—The Nash Motors Co. has brought out a 2½-ton truck which is especially adapted to highway construction work. Its general specifications are much the same as the present 2-ton model, 3018, except that the springing has been made heavier, the wheelbase shorter and some other minor changes have been made to allow for the heavier loads. The price, f. o. b. factory, will be the same as the 3018, $2,550. The wheelbase is 121 in., and the space back of the driver's seat about 97 in., this of course depending on the style of body used. Pneumatic tires may be fitted, and in such case, an extra charge is made.

CENT TAX IN PENNSYLVANIA

Harrisburg, May 28—Gov. Sproul has signed the "cent-a-gallon" gasoline tax. This law affects every sale of gasoline to a consumer in Philadelphia. More than $2,000,000 a year will be realized in revenue by the measure's operation. The tax becomes effective on Sept. 1. It is estimated that Philadelphia, for instance, will receive $350,000 a year as its share, as half the tax goes to the county where collected.

Competition of Reimported Trucks Hurt New York Dealers

Returned American Made Vehicles Offered at Low Price and On Long Terms

NEW YORK, June 1—Metropolitan motor truck dealers are beginning to feel acutely the competition of low priced trucks from the former European war areas offered for sale here by representatives of an European corporation which purchased them from foreign governments for export to the United States. The imported trucks, including several American makes, and one or two of European manufacture, are being offered at ridiculously low prices, as compared with quotations on vehicles for domestic trade. The imported trucks are also being advertised extensively both in newspapers and in direct by mail campaigns.

Dealers in some of the higher priced trucks are losing in some cases four or five, and in a few instances more sales per month as a result of this new competition.

Will Fight Reimportation

Here is a recent instance of competition. A New York dealer had a prospect who was about to buy a 3½-ton dump truck on which the list price was a little more than $4,900. When the prospect had been brought up to the point of purchase he suddenly seemed to lose interest, and within a few days the salesman found that he had placed his order for a 5-ton Sauer truck, brand new, for $3,000 on which he was to pay $500 cash and the balance in notes spread over 18 months. Of course it was impossible for the local dealer to meet competition of this sort either as to price or terms. Similar instances of sales of reimported American-made trucks could be given, showing the serious condition which confronts motor truck dealers in cities where these vehicles returned from the war zones are being sold.

For a time dealers in New York as well as in some other cities did not show much interest in the truck reimportation situation, but now that these trucks are being brought into the market in increased numbers and their sales are being supported by vigorous advertising, dealers are realizing that there has been raised up a very serious item of sales resistance. The fact that the present period is one in which a great many buyers are looking for bargains, naturally helps the agents for the reimported trucks and works against the dealers in domestic vehicles.

Dealers here are looking to the National Automobile Chamber of Commerce and the National Automobile Dealers' Association to exert the utmost pressure upon Congress and officials of the administration to place a duty on these reimported trucks which will force their prices up to a level somewhere near those of domestic make.

California, Through Parades, Shows Transportation Advance

Governor of State Proclaims "Automobile Day" Which Is Generally Observed

SAN FRANCISCO, May 28—In response to Gov. William D. Stephens' proclamation setting aside a day to be known as Automobile Day, practically every city in the state staged events showing the advance made in transportation from the earliest days to today. In this city the whole history of transportation was summed up in the three-mile procession of vehicles which passed up Market street. There was every type of vehicle from the stage coach of '49 to the passenger car and truck of the present time.

Following the committee in charge and platoon of mounted police were Indians mounted and on foot, monks of the early Spanish days, hooded and gowned; burros laden with packs and prairie schooners. Then came stage coaches with an ancient overland mail stage, around which was staged a realistic hold-up on Market street during the parade.

Display Old-Time Motor Cars

Bicycles and motorcycles had their place but the real sensation of the pageant was the display of old time motor cars. These had as passengers, women wearing leg-of-mutton sleeves and ground sweeping skirts. The drivers were men in flat derbies, long dusters and huge goggles. Following the first automobiles rolled the rubber tired buggies, carriages and cabs in which rode girls in pinafores and flowery bonnets while dignified coachmen sat on the boxes in full livery. Modern motor cars followed. This section of the pageant was a moving automobile show.

The section of the parade devoted to transportation of merchandise was headed by a group of veterans of the old city fire department wearing red flannel shirts and drawing an ancient fire engine brought around the "Horn" in 1861 when it was the wonder of California. There were two-wheeled carts, heavy drays, broom carts and these were followed by mammoth motor trucks, modern motorized fire apparatus, street sweepers, flushers and huge furniture trucks.

While the parade was passing out Market street, airplanes circled overhead. It was witnessed by Mayor James Rolph, Jr., and William Pridham, last surviving member of the old St. Louis-San Francisco pony express riders.

At Santa Rosa $300,000 worth of automobiles participated in the celebration in that city. The parade was led by a decorated new car bearing Luther Burbank, the plant wizard, Mayor W. E. Rutherford and Chief of Police George W. Mathews.

DEALERS BACK SPEEDWAY

San Francisco, May 28—The opening race on the new San Francisco board speedway is to be staged on Admission Day, Sept. 9, according to the announcement made by S. G. Rayl, head of the San Francisco Speedway Association. The association has purchased the old Tanforan race track and construction is to be commenced immediately. The project has the backing of the San Francisco Motor Car Dealers' Association as well as many prominent business men of northern California. San Francisco is the last Pacific coast center to take up the speedway project and with the two big events to be staged annually, in addition to those staged on the new Santa Rosa speedway which is now under construction, the Pacific coast racing season should be one offering great advantage to the speed kings. With the completion of the two new speed plants, the coast will have speedways in Tacoma, Santa Rosa, San Francisco, Fresno and Los Angeles.

Fine Dealers Who Engage in Speed Tests Over Highways

Los Angeles, May 27—Civil authorities have begun to make good on their threats to arrest and fine motor car dealers who engage in speed tests over the highways. On the same day that the announcement to prosecute was made a distributor who set a new record from this city to Phoenix was arrested, brought into court and fined $100 with an alternative of 25 days in jail. It is stated that subpoenas have been issued for a number of witnesses to appear and testify against other dealers who have been making record runs recently.

According to the announcement of one justice, any advertising or newspaper stories telling about record breaking performances by motor cars on the highways will be taken as prima facie evidence against the dealers owning the cars. The courts have been slow to take cognizance of these speed runs and one result of their present action will be to protect present record holders against attempts upon the part of competitors to establish new marks.

TO LEASE GARAGE SPACE

Oakland, Cal., May 26—Construction is to begin immediately upon a building to be known as the New Service Garage Auto Palace, in which individual space is to be leased, which in turn may be sub-leased if the occasion arises. Leased spaces are to be separated by bulkheads for the protection of cars. There are to be four separate entrances and the garage is being built to relieve the congestion caused by lack of parking space in the vicinity of the Hotel Oakland.

TRUCK OUTING IN JUNE

Philadelphia, May 26—The annual outing of the Motor Truck Association of Philadelphia will be held on the afternoon of June 15, at Kugler's Mohican Club house, on the Delaware river. One of the features of the program will be a baseball game between the members of the Camden Automobile Trade Association and the Philadelphia organization. There will be other sports and an old-fashioned planked shad dinner.

Buick Makes Reduction in Prices on Its 1922 Models

Guarantees Made to Public and Dealers Are Not Applicable to New Series

DETROIT, May 30—"The present lines of new Buick six-cylinder models will be carried through the 1922 season," says an official announcement from the Buick Motor Co. in giving prices effective June 1. The prices as compared with those for the 1921 models show a reduction in some of the models of as much as $660. The new series and prices are as follows:

Model 22-24, roadster, from $1795 to $1495.

Model 22-45, five-passenger touring, $1795 to $1525.

Model 22-46, three-passenger coupe, $2585 to $2135.

Model 22-47, five-passenger sedan, $2895 to $2435.

Model 22-48, four-passenger coupe, $2985 to $2325.

Model 22-49, seven-passenger touring, $2065 to $1735.

Model 22-57, seven-passenger sedan, $3295 to $2635.

These reductions are on 1922 models. The company guaranteed prices to the public to May 1 and to dealers to July 1 on 1921 models and the guarantee is not applicable to the new models.

Detroit, May 26—Federal Motor Truck Co. sent out a letter this week guaranteeing prices on Federal trucks to Oct. 1. The notice, which was sent out by W. C. Rowley, says while there has been some slight reduction in the price of steel recently, the cost of manufacture has not been effected thereby as labor and other items do not warrant any reduction. The company guaranteed prices Nov. 18, 1920, until July 1 of this year.

Racine, Wis., May 26—The Michell Motors Co. has announced reductions in the prices of the Mitchell car ranging from $210 to $260. The reductions are as follows: Five-passenger touring car and 3-passenger roadster from $1750 to $1490; four-passenger special from $1950 to $1790; four-passenger coupe from $2800 to $2590; five-passenger sedan from $2900 to $2690.

APPOINTS HOOVER COMMITTEE

New York, May 26—J. Walter Drake, chairman of the Hupp Motor Car Corp., heads a committee appointed by President Clifton of the National Automobile Chamber of Commerce at the request of Secretary Herbert Hoover to confer with the Department of Commerce. The other members of the committee from the automobile industry are: Arthur Waterfall, vice president, Dodge Brothers; E. A. Williams, Jr., president, Garford Motor Truck Co.; Alfred H. Swayne, vice president, General Motors Corp.; and Percy Owen, president, Liberty Motor Car Co.

Mulford Breaks Record for Stripped Stock Car Chassis

Time Set by Joe Dawson at Sheepshead Bay Excelled at Uniontown Speedway

UNIONTOWN, PA., May 26—Ralph Mulford, driving a Paige, broke all records for stripped stock car chassis in a spectacular performance at the Uniontown Speedway, Friday. He established a new world's record for 5, 10, 15, 20, 25, 50, 75 and 100 miles one hour. In the run is a new record for one mile on such a course, although the mile and time remains to be chosen, approved and announced officially by The American Automobile Association contest board.

Mulfords' record, unofficially, was 89.6 miles per hour average for the one hundred miles. He actually made 89.9 in the hour but under the rulings of the Three A's regarding completion of the mile, he can be credited with only 89 miles, flat, for the hour.

The records for 25 miles upwards were established in a thrilling no stop run in the afternoon; at least thirty miles being on the fabric of the right rear tire. The other records were made during the morning.

The event was under official sanction of the Three A's with G. E. Edwards, chairman of the technical committee, and A. M. Means, secretary of the contest board, in direct charge, assisted by Frank H. Rosboro, local representative of the Three A's.

In the morning's run, Mulford lowered his ten mile record which he established the preceding afternoon by three full seconds.

The distances and timing apparatus times for the various events, together with averages computed therefrom by the correspondent of MOTOR AGE follow:

Distance	Time	Aver. per hour
5 miles	3:15.83	91.8
10 miles	6:31.48	91.9
15 miles	9:45.96	92.1
20 miles	13:01.48	92.1
25 miles	16:37.94	90.1
50 miles	33:16.43	90.9
75 miles	50:00.48	89.9
100 miles	1:06:53.26	89.6
— —	1:00:00.00	*89

*Understood to be figure which can be officially given, although correspondent's figures show average 89.9.

Mulford lowered the world's records established by Joe Dawson, driving a Chalmers car at the Sheepshead Bay Speedway on July 28, 1917. Dawson's time for the 100 miles was 1:12:10.17.

Mulford gave a wonderful exhibition of driving skill in the race. Ten laps before the 75th mile post had been reached in the afternoon, his pitmen saw that one of his tires was giving him trouble. They watched it closely. A few laps later, the signal was flashed: "Do you want to change tires at 75 miles? The answer was an emphatic no through a shake of the head as the car whirled past the stand. From that time on, Mulford carefully nursed his tire, slackened only a fraction and maintained the course for the full 100 miles.

The first official time was taken Thursday afternoon, late, when Mulford set a new record for ten miles. The following morning he went out for that record as well, broke it, and set the new five, ten, fifteen and twenty mile records.

Special timing apparatus as required for such events was installed at the local track. The Speedway Association showed every effort to co-operate in the speed runs.

Equipment carried included: A. C. spark plugs; Remy electric starting and lighting; Atwater-Kent ignition; Salsbury axle; Jacox steering gear. Sinclair oils were used.

In the tests held preliminary to the actual run today, Goodyear, Firestone and Braender tires were used.

Ford, Next to Krupp, Has Largest Drop Forge Plant

Detroit, May 27—With the installation of 100 drop forge hammers which will cost in excess of $1,000,000, the Ford Motor Co. will have the distinction of having the largest drop forge plant in the world with the possible exception of the Krupp Gun Works in Germany. The plant now produces only about one-eighth of the forgings used in construction of the company's products, but with these new hammers installed every forging required by the company will be manufactured in its own plant.

This is one more step in Ford's plan eventually to manufacture every part of his car in his own plants. In addition to the manufacture of imitation leather and celluloid, the plant is now manufacturing a great majority of Ford bodies and soon will be manufacturing all of the starters used on Ford cars. The Liberty Starter Co., which heretofore has built the Ford starter, is closing its last contract with the Ford company, according to information from the Liberty factory. The contract is expected to be completed some time in June, after which the company will have to seek other markets.

The Liberty Starter closed last Friday and Saturday and expects to run on a four-day week schedule pending completion of the Ford contract.

NEW WISCONSIN TRUCK

Logansville, Wis., May 27—The Wisconsin Truck Co., for three years engaged in manufacturing motor trucks suitable for general farm and light commercial trucking, has added a larger model, called the Wisconsin express truck. It is powered with a six-cylinder Continental engine, has a capacity of 3 tons, and tire equipment of pneumatic. The design is not new, having been produced in quantities for a number of years by the Luverne Motor Truck Co. of Luverne, Minn., with which concern the Loganville company is closely affiliated financially.

Miller Engine Is Absorbed by Leach Biltwell Company

Policy of New Car Corporation and Present Models Will Not be Changed

LOS ANGELES, May 28—The Leach Biltwell Motor Co. and the Miller Engine & Foundry Works of Los Angeles have been acquired in entirety by the Leach Biltwell Motor Car Co. which has been incorporated with a capital of $5,000,000. M. A. Leach, president and founder of the motor company, becomes president and chairman of the board of directors of the new company.

At the same time, it was announced that the Leach Biltwell Motor Co. would begin 100 per cent production within three weeks and also would construct its own engine and parts which heretofore have been purchased outside of Los Angeles. Initial production is expected to be 100 cars a month which will continue during the balance of the year.

The transaction involved more than $2,000,000, as the Leach Biltwell Motor Co.'s financial statement as of April 30 showed assets of more than $1,500,000. The Miller Engine & Foundry Works was owned by Harry A. Miller, builder of engines for automobile racers, and patents covering a new engine specially for the Leach car have been acquired by the corporation. Mr. Miller becomes second vice-president and a director of the new company and also will superintend the building of the new engine.

John T. Dye, southern California Automobile dealer, becomes first vice-president of the new company; Gray M. Skidmore, treasurer; and James H. Faircloth, secretary. The board of directors was increased from seven to fifteen.

The policy of the new corporation will not be changed and all present models of the Leach will continue.

New Officers of Cincinnati Association Protesting Tax

Cincinnati, May 27—Phil Trounstine, of the H. & T. Auto Co., is the new head of the Cincinnati Automotive Dealers' Association. Frank Santry, Nash distributor, is vice president; William Welbon of the Welbon Motor Car Co., treasurer; Ed Kruse of the Newcomer Auto Sales Co., secretary and Harry K. Shockley, manager.

Directors for the coming year are Max Miller of the Pfaff Motor Car Co.; Harry Gordon of the Cincinnati Oakland Co.; Charles Schiear of the Schiear Motor Car Co.; F. D. Wood of the Cincinnati-Franklin Co. and Messrs. Welbon, Trounstine and Santry.

One of the first things that the new officers have decided to do is to protest against the recommendation of Secretary of the Treasury Andrew Mellon to the Senate finance committee that a Federal tax be placed on the individual owners of motor cars.

Dealers Present Their Views on Taxes to Senate Committee

Tell Senators Industry Is Protesting Only Against Inequitable Distribution of Burden

WASHINGTON, May 28—Vigorous protest against the assessment of proposed increases in the excise taxes upon automobiles and other forms of discrimination was made here by the National Automobile Dealers' Association in presenting their recommendations for internal revenue revision to the Senate committee on finance. They expressed the belief that any further addition in taxes upon the motor vehicle in a large manner would have to be borne by the dealers and that the sales resistance engendered by such increase would seriously jeopardize the success, progress and prosperity of the entire industry. While the general tax program of the association is in harmony with the plan of the N. A. C. C., their argument differed in that it showed the harmful tendencies of present and proposed taxes from the standpoint of the dealer.

Committee Listened Attentively

The case of the organized dealers was presented by H. B. Harper, chairman of the taxation committee. The committee listened attentively and there were few questions to interrupt his speech. He escaped the grilling which the committee forced upon witnesses for the manufacturers.

Harper pointed out to the committee that the interests of the dealers are separate and distinct from those of the manufacturers. He said that dealers pay taxes in their own communities in addition to taxes paid to the Federal government, excise, excess-profits and income taxes. It was his contention that the automobile industry as a whole is not protesting against its fair share of taxes but it believes it was time for a more equitable distribution of the tax burden to other commodities and trades.

As to the reported profits of automobile dealers, Harper directed the attention of the committee to the fact that the average dealer nets a profit of between 3.5 per cent and 4.5 per cent of his gross sales.

Automobile Is Essential

To establish the fact that the automobile is essential, the spokesman declared that it is a business car first and foremost and any recreational uses it may have are but incidental to its primary purpose, personal transportation. Sixty per cent of all automobile mileage is for business purposes. Ninety per cent of all automobiles are used, more or less, in business. Instead of being a burden upon its owner, the automobile has added a 57 per cent gain in productivity and effectiveness to the average automobile owner.

Denial was made of the theory that a tax on automobiles is to pay for surplus wealth. Mr. Harper said: "The tax upon automobiles is a tax upon moderate incomes. Seventy-five per cent of all cars and trucks outside the Atlantic States are in 37 states which have but 45 per cent of the national wealth."

Because Congress has evinced a desire to protect the farmer, the dealers' organization mentioned that a tax on motor vehicles "is as much a tax on farm production as would be a tax on threshers, plows, tractors, or farm implements. This burden is felt directly by the farmer in the purchase of motor trucks, and is felt acutely by the farmer when he is forced to pay a 5 per cent tax upon his repair parts."

Suggests Reduction of Income Surtax

In recommending the repeal of the excess-profits tax, it was declared that "this form of taxation is a deterrent to the initiative enterprise because in productive years it is nearly impossible to set aside sufficient reserves that all enduring business must have to tide them through periods of financial stress such as we are now experiencing." It was further asserted that in time of rising prices the excess-profits tax leads to the "loading" of prices and extravagance in business management, and at best is always an uncertain factor in price making.

In suggesting a reduction in the higher brackets of the income surtax, the dealers expressed the belief that it would induce capital now in exempt securities to return to industry. It was said, "this return would likewise restore the purchasing and investment power to the individuals thus employed who in turn would be a considerable prospect for the absorption of the tax-exempt securities so abandoned."

Mr. Harper stated that the automobile dealers favor the sales tax provided that it is extended to all commodities. He explained that dealers were convinced that a sales tax would be ethical and equitable form of taxation for all and would produce the desired and needed revenue.

The N. A. D. A. stressed the necessity for economy in governmental expenditures in order to reduce tax rates. It was suggested that the war debt should be distributed over several generations. They recommended the refunding of the present war debt in such a manner that it will be amortized in installments over a period of 50 years. They declared themselves in favor of a moderate protective tariff.

Tremendous Amount Paid In Taxes

To illustrate the tremendous amount of money paid in taxes on automobiles other than Federal taxation, the Association pointed out that the only state money that is at all available to match federal aid funds in highway construction and maintenance is derived from motor or vehicle registration fees.

The Senate Committee was advised that the Association represented the interest of 35,000 motor vehicle dealers, 33,000 garagemen and 45,000 repairmen whose interests are those of merchants. Others besides Harper who appeared at the hearings but did not testify were: A. E. Maltby, Philadelphia; Louis Fox, Baltimore; A. J. Shorey, Boston; R. C. Frampton, St. Louis; Charles Midelburg, Charleston, W. Va.; C. C. Starkweather, Detroit; R. C. Cook, Chicago; C. A. Vane, general counsel and H. G. Moock, general manager N. A. D. A.; Walter B. Guy of the Washington legal department of the association, and Pyke Johnson, Washington representative of the N. A. C. C.

Gen. Pershing Testifies in Hearings on Townsend Measure

New Method of Financing Highway Road Construction Through Bond Issues Advanced

WASHINGTON, May 28—Another method of financing highway construction throughout the country was advocated by E. J. Adams, former member of the Oregon State Highway Commission, and now secretary to Senator Stanfield of Oregon, when he appeared before the Senate committee on post offices and postroads in support of the proposed Townsend bill. He suggested that Congress authorize the issuance of bonds without interest which will also be legal tender for domestic obligations. He contended that this method would provide a market for bonds because Congress could authorize receipt for bonds on deposit, making them serial bonds payable over a period of years.

Bonds Must Have a Market

In support of his plans, he asserted that state highways and county roadways are built nearly all after the issuance of bonds. These bonds must have a market, he said, and the market is so congested at present that they cannot be sold. The committee appeared quite interested in his plan and questioned him as to the costs of highways. He estimated that it would cost $15,000,000,000 to build essential highways without consideration of maintenance costs.

Gen. Pershing appeared on the stand and advocated a central body, such as proposed in the Townsend bill, to direct Federal expenditures for road purposes. The general discussed highway legislation only in a general way. He stated that all roads were valuable and it was necessary at all times to get farm products to shipping points as well as to the army.

Representatives of the Federal Highway Council, organized farmers and others interested in highways appeared before the Committee this week. Senator Townsend expects to conclude the testimony by June and report the bill out for consideration at the special session.

Concerning Men You Know

Alton R. Thompson has been appointed freight transportation manager of the Packard Motor Co. of Philadelphia.

Col. Charles E. Speaks, formerly manager of tire sales for the Firestone Tire & Rubber Co., has been appointed European manager of the company with headquarters in London.

J. P. Winterson, for ten years associated with the automobile business, has been named special representative of the Stutz Motor Car Co. of America, Inc.

C. C. Sergeant has sold his interest in the Piaff Motor Car Co., Cincinnati, to his partner, Max Miller, who now is sole owner of the business.

Tom O'Brien, former head of the sales promotion department of the Oldsmobile sales organization, has been made assistant sales manager of the Oldsmobile Motor Works.

J. A. Callahan, vice-president in charge of production, has been elected vice-president and general manager of the Martin-Parry Corp., York, Pa., and Indianapolis. His headquarters will be in the York office.

Shirley M. Howe, former general sales manager of the Haynes Automobile Co., has been appointed general sales manager of the passenger car division of the Yellow Taxicab Co., Chicago, manufacturer of the Ambassador.

Judd Colwell, for ten years connected with the Goodyear Tire & Rubber Co. in Chicago, has been made Chicago branch manager of the Miller Rubber Co.

F. W. Prasp, Portland, has been appointed distributor of the Lincoln car in Oregon and the border counties of Washington.

Carl W. Hulbert, formerly major in the Motor Transport Corps, A. E. F., has joined Linger-Goff & Hough Motors, Inc., Denver, as retail sales manager in charge of Gardner Light Four and Mitchell Six. Hulbert has been identified with the industry for a number of years, more recently as distributor for the Stearns in Oklahoma.

Jack Mead, long associated with the Packard Motor Car Co. organization, has been named manager of the Davenport, Iowa, branch office. He succeeds Harry M. Jones. Mr. Mead has been in the Danville office and lately with the Chicago force.

Harrie R. Williams, director of sales and advertising for the Milwaukee Auto Engine & Supply Co., manufacturer of Milwaukee timers and guardian bumpers, has resigned.

Ivor McCulla, recently connected with the Willys-Overland, Inc., in a technical service capacity, has been appointed service manager of the Bijur Motor Appliance Co., Hoboken. S. S. Jenkins, formerly the Detroit manager of the Bijur company, has been made general sales manager with office at Hoboken.

James A. Post, for nine years identified with the industry in Chicago, has been appointed sales manager for the Schuett Motor Car Co., Chicago, distributor of the Paterson and Elkhart.

J. N. La Belle, formerly assistant manager of the Chicago branch of the Black & Decker Mfg. Co., has been appointed manager of the Kansas City branch which includes Kansas, Nebraska, Oklahoma, Texas, Arkansas, western Louisiana and western Missouri. He will be assisted by Emery Harris, who will make his headquarters in Omaha, and R. Brice Shipley.

John H. Dwight, formerly general manager of the Belle City Malleable Iron Co. of Racine, Wis., who some time ago joined the General Motors staff as assistant general manager of the Saginaw Products Co. at Saginaw, Mich., has been promoted to the position of general manager, succeeding M. R. Hannum, who goes to Oldsmobile at Pontiac.

F. Elbert Glass, for eight years connected with the Oakes Co., Indianapolis, manufacturer of radiator cooling fans, automobile tire carriers and other parts for automotive vehicles, as sales engineer, has been appointed sales manager of the company.

George R. Cott, superintendent of the Pacific coast plant of the Chevrolet Motor Co., located at Oakland, Calif., has resigned to become associated with the new Durant organization. He is to have the supervision of the building of the Durant plant and will continue with that company in the capacity of factory superintendent.

L. D. Allen, former head of the L. D. Allen organization which distributed the Cole in northern California, has secured the distribution of the Anderson Six throughout California, Arizona, Oregon, Washington, Idaho, Montana and British Columbia. Headquarters will be in San Francisco.

J. T. Lawson has been appointed district supervisor in the Chicago district for Maxwell-Chalmers.

Richard Wolfe will be in charge of Lafayette sales in Chicago under the direction of the Chicago-Nash Co., H. T. Hollingshead, president. A Nash association has also been made in Philadelphia where the Lafayette will be distributed by the Philadelphia-Nash Motors Co.

L. A. Hannan, who for the past year has been Pacific northwest branch manager for the Scripps-Booth Co. of California, wholesale distributor for the Scripps-Booth on the Pacific coast, has been promoted to the position of assistant to the vice-president of the company with headquarters at Los Angeles.

Shuart Named Secretary of New Michigan Association

Detroit, May 26—H. M. Shuart, manager of the Detroit Auto Dealers' Association, was named secretary of the recently organized Michigan Automotive Trades Association at the initial meeting of the board of directors yesterday at which plans were outlined for efforts during the formative period. Mr. Shuart will be in active charge of the association affairs pending the election of a manager who will be named in the near future.

The work of the state association will be handled from the D. A. D. A. offices here, and it is probable that even after the new organization is completed, the two associations will work in close harmony.

Since the date of the organization convention May 10 and 11, rapid strides have been made for increasing membership, and the directors express confidence that within six months the Michigan association will be the strongest in the country.

Although confronted with much detail in connection with the matter of incorporation, the directors were able to give a great amount of thought to the course to be pursued during the coming year in order that the greatest good may accrue to members. Plans for much constructive work already have been started which not only will redound to the benefit of those in the trade but to all owners and operators of motor vehicles.

LA FAYETTE REDUCES PRICES

Indianapolis, June 1—The La Fayette Motors Co. announce the following reduction effective today: Touring car, Torpedo and roadster from $5625 to $4850; four-door coupe from $7200 to $6250; sedan from $7400 to $6500; limousine from $7500 to $6750.

PIERCE-ARROW TO KEEP MIXTER

New York, May 27—George W. Mixter, who has represented G. W. Goethals & Co., Inc., in the management of the Pierce-Arrow Motor Car Co. since 1919, has been invited by the directors of the Buffalo company to become the president of Pierce-Arrow and it is understood that he will sever his connection with Goethals to accept.

The Goethals company was employed by the Pierce-Arrow company to assist in bringing the plant to a peace-time basis and also to aid in reviving its line of cars and trucks. This work has been accomplished and a new line of vehicles, both passenger and commercial, has been placed in production.

Mixter has been in active charge of the plant since that time and his management has been entirely successful.

Car and Truck Thefts Last Year in Los Angeles, 1654

Los Angeles, May 27—Motor thieves absconded with 1,654 vehicles of an insured valuation of $1,315,810 in Los Angeles last year. Their activities were not confined to passenger cars as a number of trucks are included in the list, which has just been compiled. From the speed that has been shown during the first four and one-half months of 1921, thieves will reap an even richer harvest in 1921. There is no record of accessories which have been stolen when the complete vehicle was not taken. Carelessness on the part of owners is assigned as the principal reason for this enormous loss. More thieves were apprehended and jailed than ever known before but seemingly they multiply faster than the police can overtake them. Statistics do not show the number and value of vehicles that were recovered after having been stolen but it was large.

The largest number of any one make of cars stolen was 591 Fords. Next in popularity was the Buick with 202. The Cadillac was considered the best picking in the high-price cars. The activities of motor thieves and the great loss that is suffered by insurance companies have led insurance officials to give serious consideration to increasing the rates against theft very materially.

PREMOCAR FOR CUBA

Birmingham, May 27—J. T. Driver, vice-president and general sales manager of the Preston Motors Corp., manufacturer of the Premocar announces initial steps of his concern to go after export business. E. I. Matthews, formerly with the state auditing department of Florida, has been assigned as distributor for that state and Cuba. Mr. Matthews expects to leave for Cuba in the near future to perfect his sales and distribution organization for that territory and to launch an extensive advertising campaign.

LATEX INCREASES OUTPUT

Fond du Lac, Wis., May 27—The Latex Tire & Rubber Co. has increased its daily output of casings to 150, the maximum so far reached in the new plant completed about a year ago. It is operating 24 hours a day and employing 100 operatives. Its big problem is production rather than distribution, for orders are considerably in excess of capacity. One order is for 78 casings a day under private brand, and a general contract for 50,000 tubes. The mechanical rubber goods department is also developing rapidly.

Kansas City District Dealers Hear Gov. Harding's Message

Reserve Board Head Tours Middle West to Impart Information on Conditions

(*Continued from page 21*)

modities than any other of the twelve. While it is chiefly agricultural, it has all departments of agriculture, besides oil, minerals and commerce in its various states.

"The Tenth district was not exempt from the national joy ride beginning in October, 1919; it was called on to distribute credit equal to its entire lending power. By April, 1920, it had rediscounted and borrowed ten million, which sum was later increased to thirty-five million dollars, from other districts.

"Lending by this bank had to stop, that our credit be conserved. It was necessary to scrutinize all paper for rediscount. Every class was scrutinized. It is true that in accordance with our responsibility to the general agricultural situation we felt that we should accept the most essential paper. The impression prevailed that the Federal reserve ank had declared automobile paper not sential. **We never suggested to a mem-r bank that it not freely lend to dealers.** We did say to banks, you have ample loans on agriculture and live stock to take up your limit; we prefer you send us that and keep the other in your portfolio.

Automobile Paper Welcome

"Twelve to fifteen per cent of a bank's portfolio is the usual proportion for rediscount with the Federal reserve bank. There is ample room in each bank's portfolio for all the automobile paper it might wish to take. The year 1920 was a hard one, with the reserve close to the irreducible minimum. We had a liability to those member banks which had not used our facilities, of sixty million dollars. Our responsibility to the district was for the best good of all, including yourselves.

"If we hadn't acted in the way we did act, you wouldn't be selling cars now. But the corner seems to have been turned. We can see it more clearly today than thirty days ago. If nothing extraordinary happens in the next week or so we can congratulate ourselves that we are fast getting back to normal. And there will be no further scrutiny of paper other than for solvency and desirability."

This statement was greeted by applause and cheers. Gov. Harding was introduced after Gov. Miller, and opened his address by saying that he presumed the audience had heard, from Gov. Miller, what it had come to hear.

An Essential Implement

Asa E. Ramsey, chairman of the board of the Kansas City reserve bank, and the directors of this bank, were also guests. Governors and Federal agents of further west and northern districts were also guests, having come to Kansas City for conferences with Governor Harding. Among them were John U. Calkins, governor, and John Perrin, reserve agent, San Francisco; R. A. Young, governor, and John H. Rich, reserve agent, Minneapolis. Mr. Calkins is remembered as the reserve bank governor who made this statement in 1919 regarding essential commodities: "I cannot say whether one commodity is more essential than another, because I don't know, but everybody seems to agree that the farmer's implements are essential; and I am inclined to think that the farmer's motor car is his most essential implement."

B. B. Bachman Selected As New President of Engineers

West Baden, Ind., May 28—At the close of the very successful meeting of the Society of Automotive Engineers here it was announced that B. B. Bachman, chief engineer of the Autocar Co., had been selected by the nominating committtee as the next president. Mr. Bachman has attracted much attention by his work as head of the standards committee.

The chief interest in the session developed in the combustion session and it was the feeling of all the engineers that within a very short time the studies in turbulence by Harry L. Horning, Prof. C. A. French and others would have a beneficial effect on engine design had become a considerable force in fuel economy and elimination of engine knocks.

Dealers and service men will be especially interested in the adoption of the standards committee report for a standard front axle for truck and of standard dimensions for truck body mountings.

STUTZ NOT CRIPPLED

Indianapolis, May 28—Rechecked inventories fix the loss from the recent fire in the warehouses of the Stutz Motor Car Co. of America, at slightly below the original estimate of $100,000. First surveys indicated that production at the plant would be crippled for from 30 to 60 days. It is said this week, however, that production in almost full capacity can be under way by June 1 if material shipments are received. Replacement of almost the entire stocks of tires, trimming and unholstery, is necessary.

FARMERS TALK POOLS

Indianapolis, May 28 — Co-operative buying and pooling of motor equipment were two subjects discussed by the purchasing agents of Farmers' associations of Indiana and neighboring states, who met here this week. O. J. Stierwalt of the Ohio Farmers Commercial Service, and W. H. Wagenbreth of the Missouri Farm Bureau, were the principal speakers. Some of the "doctrines" advocated by these speakers would make the purchasing bureaus of farmer organizations, huge distributing centers for vehicles, implements, etc. It was plainly intimated that one large manufacturer would readily make contracts with the farm bureaus, allowing substantial discounts for exclusive markets.

South Carolina Association Backs Progressive Movements

Participates In Steps Which Will Tend To Improve Conditions Throughout State

COLUMBIA, May 28—Instead of idly bemoaning present condition the people of South Carolina are looking to the future and are working along lines that will not only help to eliminate these conditions more quickly but will also, as far as is humanly possible, prevent a recurrence of them. The South Carolina Automotive Trade Association under the leadership of A. Mason Gibbes, its president, is taking a very active part in several of the progressive movements that have been launched in the state.

The prosperity of South Carolina is absolutely dependent upon the prosperity of its cotton growers. The growers are planning for the future by the organization of a co-operative marketing association.

The South Carolina Automotive Trade Association is lending what assistance it can to the farmers in their organization. It realizes that business is dependent on the prosperity of the farmer.

The association has taken a very active part in the formation of the South Carolina Good Roads Association, the organization meeting of which was held in Columbia last week. This meeting was attended by several hundred of the most representative citizens of South Carolina and a strong organization was perfected.

President Gibbes was one of the callers of the meeting and Harold C. Booker, secretary, acted as secretary of the meeting. Mr. Gibbes was elected one of the vice presidents of the good roads association, which proposes to launch at once a vigorous campaign for the construction of permanent highways in South Carolina.

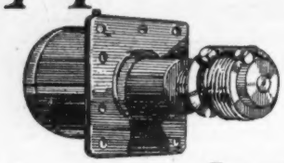
The trades association is also lending its assistance to the organization of the South Carolina Educational Association, which will be perfected at an early date.

It is the belief of the forward looking people of the state that the perfection of the co-operative marketing association for the orderly marketing of the cotton crop, the construction of permanent highways and the strengthening of the educational system of the state will put South Carolina in a few years in the foreground of all of the states.

REVERE CONDITION UNCHANGED

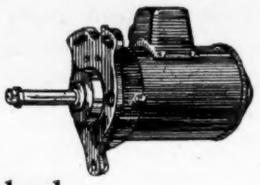
Logansport, Ind., May 28—The financial condition of the Revere Motor Co. remains almost unchanged. The necessity of selling $1,250,000 of stock for refinancing and placing the factory on production, is readily admitted as considerable of an undertaking. It is practically certain that the money cannot be obtained in Logansport, despite the fact that quite a few Logansport men have gained control of the crippled organization.

How the Electric System Works



Article VIII

By A. H. PACKER
Instructor, Ambu Engineering Institute



Locating Electrical Troubles by a Systematic Method

A Short Series of Articles Wherein Is Given the Fundamentals Underlying the Operation of the Modern Electric System as Applied to Automotive Apparatus

ON my last trip to Westville, I had tried to give the Red Head plenty of things to think about, for I had loaded him up with sketches on generator regulation and had told him to study these a bit and also to look over the previous diagrams and instructions, and as I rattled up to Bill Fixit's garage I found both Bill and his helper hard at it on a trouble shooting job.

The Red Head was trying to figure out the possible cause of the trouble, and Bill was going after it in his "poke around and hunt for it method" which usually got results if he kept at it long enough. "How am I going to find any trouble from the things you tell me about," said the Red Head as soon as I came near, "You have told me all about the way the stuff should work, but not a word about what might be wrong **when it doesn't work."**

"Well, Son," I answered, "The fellows [illegible] out the same question up to me and [illegible] t a list of every possible thing that can go wrong on a car, and I usually tell them that their job is, in a way, like that of a bank cashier. He studies the nature of a **real dollar** until he knows it so well that he can tell in an instant what is wrong with a counterfeit. Now if you will do the same thing and study the electrical system as it **should** work you will very easily locate the trouble **when it does not work."**

There are, of course, certain defects in electrical systems that are frequently encountered, and we will, therefore, consider the normal action of the circuits shown in Fig. 1, and then look at it again with the idea of hunting the possible troubles in a systematic and logical manner.

Circuits

The battery in the diagram is shown with its negative terminal grounded by means of a heavy cable which is securely connected to the frame. This connection at the frame should be made by first scraping the frame and then coating it with solder. When the cable terminal is bolted to the iron only, the connection will eventually corrode or rust and the resistance of this connection will be sufficient to prevent the starter working. From the positive terminal, a cable goes to the starter switch.

At both battery terminals the connections should be scraped or sandpapered clean when being tightened and should then be coated with vaseline to resist the action of the acid which creeps up over the terminals, causing corrosion which also affects the operation of the starter.

Another heavy cable goes from the starter switch to the motor and the motor is grounded, usually by an internal connection which completes the circuit, as the motor is securely attached to the engine. The starting motor circuit is then from the positive battery through the starting switch to motor and through the motor to the engine, then to frame of the car and back through the frame to negative battery.

The connection from battery to ammeter is usually made from the end of the positive cable that is at the starter switch, for either end of this cable is the same electrically and this method avoids the possibility of the acid eating into and affecting the smaller wire should it be connected right at the battery. From the other ammeter terminal a connection goes to the lighting switch, and from there current goes through the fuses to either the side and tail lights or to the head and tail lights depending on whether the switch is thrown one way or the other.

The current that goes to the lights goes through the filament to ground and like the starter current returns through the frame of the car. From the ammeter another wire connects to the cutout, so that current from the generator can flow to battery when the cutout closes. As the generator begins to operate, the flow is from the upper brush through the field and the field fuse, to the third brush at the side of the armature. At the same time current flows to the shunt winding of the cutout switch and through it to ground, and back to the lower generator brush.

As the speed increases, the voltage becomes stronger and the cutout becomes more strongly magnetized and at the proper time closes its points, allowing about 1½ amp. to flow to charge the battery, this current increasing, of course, with further increase in speed. With the connections shown it will be observed that discharge current which flows from the battery to the starting motor does not go through the ammeter, as this heavy current would burn out the ordinary instrument, and if the meter were made heavy enough to stand starter current, it would not be sensitive enough to read lamp and charging current.

For this reason the starting current flows as described. Current to lamps, however, goes through the meter from left to right, when the lamps are turned on and the engine is standing. When the engine runs, however, the current from the generator flows through the ammeter from right to left, which reversal of current causes the meter needle to turn to the charge instead of the discharge side of the scale.

Normal Operation

When the starting button is pressed, current should, of course, flow to the motor and cause it to crank the engine. If the lights are turned on at the time the starting button is pressed, it will be noticed that they become slightly dim just while the engine is being cranked, due to the heavy current used by the motor. The heavy current drawn from the battery reduces the battery voltage which accounts for the dimming of the lights. When the lights are turned on,

What Do You Know About Electricity?

NOTHING stumps the average mechanic, and even the expert sometimes, so much as to have something go wrong with the electric system of a car, truck or tractor. You cannot see a case of electrical trouble as you can a broken axle shaft or burned-out connecting rod bearing, but it is possible to intelligently "shoot" electric trouble if you know the fundamental principles on which the systems operate.

It is the purpose of this series of articles to so acquaint the mechanic or service station operator with the whys and wherefores of the electric system that he will the better be able to render the right kind of service to his customers. There is nothing like knowing how, and how to "shoot" some of the more common forms of electrical troubles will constitute a large part of this series.

the ammeter should show about 2 amp. discharge if tail and side lights are on and about 6 amp. if tail and head lamps are lighted.

When the lights are not on and the engine is running the ammeter should indicate charge, the amount varying with the type of generator and the engine speed, the maximum output usually being between 10 and 15 amp. If lights are on at the same time that the engine is running, the ammeter will show the amount going to or from the battery. At low speed this may mean a slight discharge current, while at high speed the ammeter might show 4 amp. charge if the generator is producing 10 amp., but the light load is 6 amp.

If the car is run enough to replace the current used in the lamps and starter, the gravity of the battery will show from 1250 to 1280 while if the car is not run very much, the battery gravity will gradually drop until it is about 1150 at which point it will probably refuse to crank the engine, an abnormal dimming of the lights also being observed when an attempt to start is made.

Starting Trouble

When the customer says that his starter does not work, there is a chance that the starter is actually at fault, but the trouble is just as likely to be in the battery, or the switch or connections.

To get an idea as to the general nature of the trouble it is well to turn on the lights. If these are very dim or do not light the trouble is apparently in the battery or else a heavy short exists in the wiring which holds the battery voltage down. To detect a short, the lights should again be turned off and a cable removed from the battery. If a flash is observed as the cable is removed, it indicates a leakage of current, but if no flash is observed, the battery is apparently low, and the hydrometer and voltmeter can be used to determine the battery's condition.

If a leakage of current exists it may be in the generator cutout points being stuck, causing the battery to discharge through the generator. This can be eliminated by disconnecting the generator, or if leakage in any other wire is suspected it can be disconnected, until the cause of the trouble is found.

Another possible action of the lights will be their lighting up brightly when first turned on, and going completely out the instant the starting button is pressed. This almost invariably indicates a corroded connection either on one of the battery terminals or at the place where the grounding cable is bolted to the frame.

This may prevent starting current from flowing even when the connections seem mechanically tight, so it is necessary to step on the button for a few seconds and then quickly feel the different connections as a high resistance due to corrosion will cause that connection to rapidly become warm. Another way to locate the poor connection or high resistance is to use a voltmeter. In our

General Wiring Diagram of Two Unit, Six-Volt System

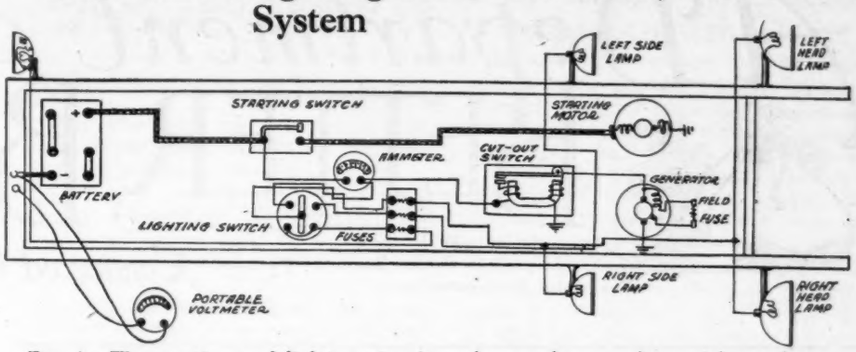


Fig. 1—The starting and lighting circuits only are shown. A special test for a ground contact from the battery is shown where the voltmeter is secured

first articles we found that when current flows through a resistance, it can be detected by the voltage drop across the resistance.

This method of locating the trouble is indicated by the connection of the portable voltmeter at the rear of the car. One lead to this meter is connected to the frame of the car, and the other to the terminal. **The starting button must be pressed** in order to have an indication on the voltmeter, and if this shows a volt or two, the connection should be removed, filed or sandpapered clean and replaced.

If, however, the voltmeter needle barely moves, it indicates a normal connection as there is always a slight loss of pressure at each connection even when properly made. In similar manner the voltage drop can be taken between the terminal and the cable, also at the battery between the posts and the terminals that are attached to them, also at the starter switch and any place that trouble is suspected.

If the lights do not go completely out it may indicate trouble in the battery itself, which can also be detected by means of the voltmeter. This should now be connected across one cell at a time, the reading being approximately 2 volts. When the starting button is pressed, this reading will drop, however. If the cell is O.K. and well charged the voltage may drop to about 1.8.

If the cell is not defective but is merely in a discharged condition, the voltage may drop to 1.5 or less. Should the cell be defective, having broken down separators, the voltage will rapidly drop to zero and even show a reverse reading due to the current forced through it by the good cells.

If the lights are bright and remain so when the starting button is pressed it indicates that the starting circuit is open and that no current is flowing to the motor. In the writer's experience this has commonly been due to the motor brushes being burnt away, also to a burnt condition of the commutator which requires removal of the starter, turning of the commutator and the installation of new brushes.

To see if this is the case, remove the commutator cover and push on the brushes, at the same time having someone operate the starting switch. If the motor now cranks the engine, the trouble is as above indicated, but if there is still no action the voltmeter should again be used. First connect one lead to the frame and move the other lead along the starter circuit. At the positive battery a reading should be obtained, also at the starter switch. If no reading is obtained at the switch the trouble is in the cable from battery to switch.

THE STARTER SWITCH SHOULD BE OPERATED EACH TIME A VOLTMETER READING IS TAKEN

If one side of the starter switch shows a reading and the other does not it obviously shows trouble in the switch. If both sides of the switch are alive, voltage should be taken at the motor and if there is no reading there the trouble is in the cable from switch to motor. If there is voltage at the motor, however, and no current flows through the motor, as indicated by no dimming of the lights, the starter should be removed as there is apparently an open circuit in the starter itself.

Starting motor trouble can usually be located by inspection, the usual cause of an open being burnt commutator and short brushes, or if there is a break, it is easily seen because of the large size of the copper conductors used. To test for grounds a 110 volt lamp line should be used, with the normal ground disconnected, and this test should be made on armature and field coils.

The armature resistance is so low and the windings so heavy and securely anchored that shorts rarely occur in starting motor armatures, although partial opens due to poor soldering at commutator bars, are occasionally encountered.

Trouble in Lights

Trouble in the operation of lamps is often due to fuses being blown, but as this is usually an indication of a shorted or grounded lead from the fuse box to lamp, it is foolish to replace the fuse without first correcting the trouble as the new fuse will also blow. Where separate fuses are used for each circuit as indicated in Fig. 1, it is not likely that all of the circuits would become grounded at the same time, so that if all

(Continued on page 43)

A Department of BETTER BUSINESS

A dollar will be paid for all ideas accepted as Better Business—Perhaps you have some.

Conducted by Ray W. Sherman

Backs Used Car Sale with Personal Reputation

J. D. Cathey, Inc., New Orleans, a firm which ordinarily does a large business in both new and used cars, put on a special sale of "reconditioned cars" for the week of May 16-21, with a pedigree and guarantee with every car.

In making the advertising announcement of this sale, J. D. Cathey, president of the firm and one of the leaders in the New Orleans Automobile Dealers Association, said:

"I want the public to know that I am not trying to unload a lot of cheap, worthless cars on the market. Every car has been priced on a basis of honest value, regardless of its cost to us. In going over the prices, consider the fact that they carry our guarantee, and are backed by our reputation for honest dealings.

"You have my word that they are absolutely right, mechanically and otherwise. Never in the history of our business have we held a used-car sale, nor are we holding one now, but we have just had sufficient cars put in perfect shape to conduct a sale of rebuilt cars. We have the history of every car in this sale and these cars are sold subject to the most rigid tests and demonstrations."

Such advertising as this, which has been done extensively by the dealers in new cars but seldom by the dealers in rebuilt automobiles, has done much to direct the prospective car owner into paths from which he emerged with an automobile.

A New Car Guarantee with All Used Cars Sold

The Miller Automobile Co., Dodge dealer at Sacramento, has instituted the practice of rebuilding all used cars taken in and turning them out with a "Maco" guarantee. This has been quite successful, as has also the plan of the Sacramento Buick Co. along the same lines, in rebuilding, repainting and re-topping its used cars and selling them with a new car guarantee.

Pointing out that the buyer of a used car saves the dealer's profits, war tax and freight charges, the latter not inconsiderable in the Sacramento territory, these two firms have been keeping their used car departments quite clear of any undue accumulation of used cars.

Bringing Home the Tractor Operator

When a tractor is delivered to a farmer a second man often must go along with a car to bring back the tractor operator. Mr. A. M. Spencer, a power farming dealer at Iowa City, Ia., has a device which enables him to tow a Ford car behind the tractor. It fastens to the front axle and steering tie rod so that when the tractor turns the front wheels of the car are turned so the car follows. This device which is home-made has saved many dollars in time for them during the last four or five years.

Civic Pride as a Trade Booster

F. R. Wulff, automobile, truck and trailer dealer at Brady, Texas, cleaned up the vacant lot at the rear of his place of business and received an editorial notice in the local newspaper which cited him as a good example in the town's clean-up week campaign.

"Last week," the paper says, "Mr. Wulff had the lot plowed up and harrowed down. Since then he has had Bermuda grass set out in the lot. Once the Bermuda takes root, it will spread rapidly, and by the time the summer weather is here it will have covered the ground with a velvety carpet, which will choke out the growth of weeds. With a few days' labor, Mr. Wulff has converted this lot from the habitat of a wilderness of weeds into what promises to become an ornamental and attractive little park.

"There are five hundred or a thousand vacant lot owners in Brady. Each and every one of them needs to be imbued with the Wulff spirit of making Brady beautiful."

Placing this dealer before the public as a public spirited citizen is one good way of bringing the town buyers to his place of business and encouraging their co-operation to make his business a success.

Pins and a Map Used as Demonstrators

What percentage of the cars in your territory are open or enclosed cars? That is what the people are trying to find out at Ames, Ia. The Dunlap Motor Co. has a map in a window and has represented each enclosed Ford with a red top pin and each open one with a pink top pin. The company's main idea is to get passersby to counting and figuring so that they will realize how many people drive enclosed cars. The stunt is getting results and is only one of many of the Dunlap's advertising plans.

News Items From Owners as Advertising

Every dealer can get considerable business from those owners who use their cars for outing trips. By getting all the news items of his customers who are on a trip into the paper he can create a desire among many of his other customers. One dealer has each of his customers write him at frequent intervals and uses the news. Another has pictures of many camping and fishing parties on display in his salesroom. Another keeps an excellent window display of camping equipment and a list of those who are traveling in one of his cars and with his outfit, on the window.

Getting Cash to Finance Tractor Sales

When a farmer has no cash and the bank doesn't want to loan it to him to buy a tractor do you quit? In two cases one dealer found that such customers had insurance policies upon which they could get the needed cash at five or six per cent and by calling the matter to their attention made the sale. It has been so long since people had to use all their credit that they have forgotten all the kinks. Insurance money comes from without the community, so does not affect the cash capacity of the local banks.

Playing Up Selling Points in Service

"We will give you exact prices on labor before starting work on your car," states one dealer in all of its advertisements and this statement makes a big hit with the many motorists of the city who see the ads and who patronize the dealer.

Wouldn't other dealers find it profitable to advertise the special features of their service in the same way? Wouldn't it be a good plan to pick out the best selling point in the dealer's service and then to play it up strongly in the ads?

Getting Cooperation from Highway Bureaus

Do you cooperate with the highway information bureaus in your city? In most of the larger cities of the country there are various highway information bureaus during the summer time where autoists can secure information regarding road conditions. Generally a large number of people avail themselves of the opportunity to get information from these bureaus and quite often they want to be directed to garages or dealers where they can have repair work done, secure new tires and so on. Consequently it would be good business for the dealer to get on friendly terms with the information men at these bureaus and to drop in at the bureaus himself every now and then. By doing this he would be assuring himself a certain amount of business from the people patronizing the bureaus for himself.

A Service Car That Attracts Notice

The Northern Indiana Motor Car Co. of Fort Wayne, Ind., has found it worth while to make its service car so distinctively attractive that every time the car goes out on the streets it attracts a lot of attention and creates a lot of favorable comment, thereby giving the concern a considerable quantity of mighty valuable free advertising. The concern has made its service car especially attractive by painting it a rich red and by putting on a body which somewhat resembles an open police patrol. There is a seat on either side of the car, running lengthwise, and a brass railing about six inches high, running around the body of the car. The entrance to this striking body is from the rear.

Using Farm Bureau Records for Tractor Sales

In many counties farmers are keeping cost accounts of various farm work in connection with the work of the Farm Bureau. These costs are reliable and taken without reference to any advertised product. One power farming dealer got some excellent advertising from the costs of plowing turned in by owners of tractors. His bills and advertisements showed:

Cost of—

Plowing with Tractor....35 cents per acre.
Plowing with Horses.....$1.55 per acre.
Double-disking with Tractor.....9 cents per acre.
Double-disking with Horses.....60 cents per acre.

This advertising not only extended his business interests but also the good work of the Farm Bureau.

The Tractor Salesman to Lay Out Lands

According to W. S. Falk, star tractor salesman and dealer in Iowa this spring, farmers may not know much about tractors, but they do know a good job of plowing when they see it. He seems to be an artist at laying out straight lands and says it always has a pleasing effect on the farmer. He also contributes much of his success to knowing how to set the plows to do a good job under any conditions. Would it not be advisable for some of the sales room type of tractor salesmen to get out and practice up on laying out lands and setting plows?

Non-Essential!

They say I'm a "non-essential,"
Although I have saved men's time.
They say I'm not needed, though
Work should be speeded,
And slowing up now is a crime.
Suppose that the folks whom I carried last year,
Had suddenly changed all the styles,
I wonder how they would have gone, as they did,
Some fifty-six billion miles.

They say I'm a "non-essential,"
Although I helped lick the Huns.
They viewed the old horse with a pang of remorse,
But used me to haul guns.
From the Marne to Argonne I was always the one,
To back up the ranks and the files,
My record is clear; they rode me last year,
Just fifty-six billion miles.

They say I'm a "non-essential,"
And class me with jewelled knobs.
They would do without me although when they rout me,
A million of men lose their jobs.
Go back to the days when cars were not seen,
As far as your fancy beguiles,
And thank me for roads that helped folks to ride
For fifty-six billion miles.

All right! I'm a "non-essential,"
And so is the telephone.
The tractor is foolish, the airplane is ghoulish,
And coal oil lamps used alone.
Let's use the sun-dial, let's sew clothes by hand,
And ride behind Dobbin all smiles,
He'll go a long ways, before he comes up
To fifty-six billion miles.

—William A. Simonds.

Full Supply of Accessories Business Getter

A recent advertisement of an accessory dealer makes this statement: "The best place to buy your automobile accessories is where you can buy all your wants at one store." The ad then goes on to list a number of the accessories carried in stock and concludes by making this statement: "For the past six years our aim has been to build up a business so complete as to have any accessory an automobile owner would need. This enables the automobile owner to save lots of time and worry by coming direct to our store and getting everything he needs."

A Stall for Each Car to Prevent Thefts

Probably the chief objection to storing a car in a public garage is that it may be tinkered with or its contents stolen. One dealer has solved this problem of building slat stalls for each car. The owner drives his car in and locks the door. In this way each car is always in place and no trouble is taken in watching them. It also commands more rent and is not expensive. The stalls are on a slight angle so it is easy to head in from the door.

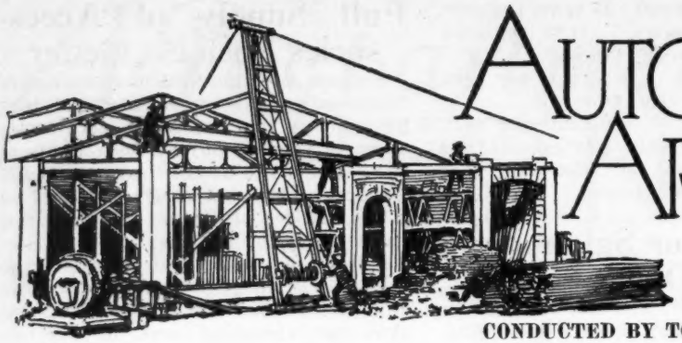
Making Capital from Vacant Property

Very frequently garages, well located, have vacant space at the side or back that is of little or no value to the owner. The owner, perhaps, intends to build or use it for other expansion purposes but in the meantime it produces nothing and eats up a portion of the profits in taxes.

The Anthracite Garage, in the downtown section of Scranton, Pa., had such a plot. But its owner was well aware of the fact and finally solved the problem. He put up a large sign reading "Parking 25 cents an hour" and as parking space in this city is rather cramped and often found to be entirely taken up it was not long before many regular customers were obtained. Furthermore, this sort of parking affords a protection against car thieves and in cities which are subject to them it is an added inducement to park for a trifling cost rather than take a chance on finding only the trace of gasoline in the place where the car was left.

A Tire Track to Catch the Eye

Certain tire manufacturers have featured the track that their tires make in mud or dust, but few dealers have taken advantage of this kind of publicity, at least have done so only with pictures. The Rude Auto Co., of Marshalltown, Ia., placed some sand in a small window, and rolled a tire through it to the stand upon which it was to be displayed. The stunt catches the eye of many of the people who pass by and causes them to take a second look, or at least to comment on the idea.



AUTOMOTIVE ARCHITECTURE

Planning and Building Problems

CONDUCTED BY TOM WILDER

Flatiron Forms for Stall Guides

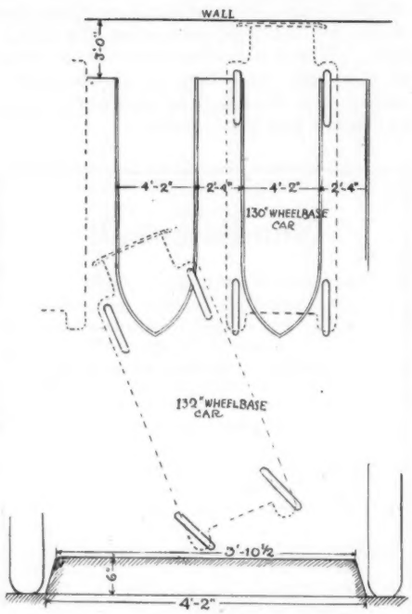
WE wish to be advised the correct size of cement flatiron car stall guides, their length, breadth and the distance between. Our building will be 120 by 120, two floors, and we propose to make it the most convenient and attractive service station in the city.—Creek Motor Sales Co., Milwaukee, Wis.

We cannot give you any advice, not having the information necessary except the lot size. We will be glad to draw you a plan, however, if you care to give us the necessary data.

In building your flatiron forms, the width of the forms is dependent upon the spacing of the cars; that is, if they are spaced farther apart, the forms need not be so wide. Our diagram is laid out for a spacing of 6 ft. 6 in. per car and in this case the forms must come pretty close to the inside of the wheels since there is less than a foot between fenders of adjacent cars.

If the forms are made narrower and the cars have enough leeway to graze one another in backing into the positions, all the expense of building them will be in vain and white paint stripes would be just as effective or even more so as no dependence would be placed on the paint lines and drivers would use more care in parking.

The sides should be slanted or beveled and the top corner rounded off so that tires will not be injured as they scrape along the edge. Six inches is a good height, 4 in. would not ward off large heavy cars, while 8 in. might touch the brake drums of some cars and injure them. The lower part of our diagram shows a section through a form with the relative position of the tires on each side.



Dimensions for car stall guides are given here. The lower view shows wheels and relative position on each side

Estimating Cost of Building

We want to erect a building in a semi-residential district which will incorporate the following departments: (1.) Machine and repair shop, three to five mechanics, automobile laundry. (2.) Salesroom, five cars and one truck, office space, storage (as many cars as possibe), battery service, tire service, accessory salesroom. (3.) automobile topping and repair shop (4.) Paint shop, electric oven and paint room. (5.) Spare parts department.

The building will include a basement beneath the entire building and stories above. The price of this building we figure will be between thirty and forty thousand dollars. If in your judgment, these various departments cannot be installed and still keep within this appropriation, please suggest what department to dispense with.—B-N Motor Co.

Rather than lay out a plan for your building which we are confident will cost at least twice the amount you have appropriated, we suggest that you reconsider the size of the building or the size of the appropriation. Architects, in making rough estimates, use two methods, one based on the cubical contents of the building from the footings to the mean height of the roof, and the other dependent on the floor area.

We have never heard of a building being put up since the war for less than 20 cents a cubic foot, and often they cost from 30 to 40 cents. The square foot cost runs at the present time from $3 to $3.50. Perhaps you have advantageous building conditions in your town, but even so we believe there is no chance of bringing the cost down to the figures you mention.

We will postpone action on the layout until we hear further from you, it being our purpose to save you the trouble and disappointment of getting your plans all framed up only to find that they cannot be carried out. The fact that the excavation is already completed will help some and you can save on the material from the old building, but it is not safe to count too much on this saving as part of it will be eaten up by the increased amount of labor necessary in using the old material and in getting it ready for use.

Perhaps you could build the basement and first story now and add the second story later. You could use the basement for storage, gaining entrance via a ramp to avoid installing an elevator and devote the entire first floor to show room, office, and shops. It would cost more in the end to build this way and if the money could be raised for the entire building that would be the best. However, the other would be a possibility worth considering.

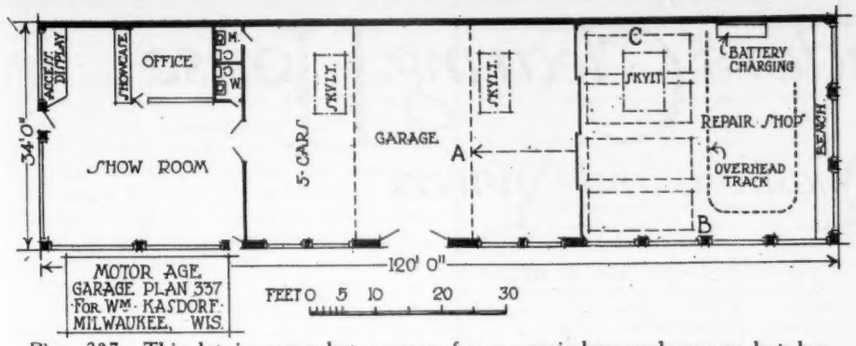
Repairshop on a Corner Lot

PLAN 337

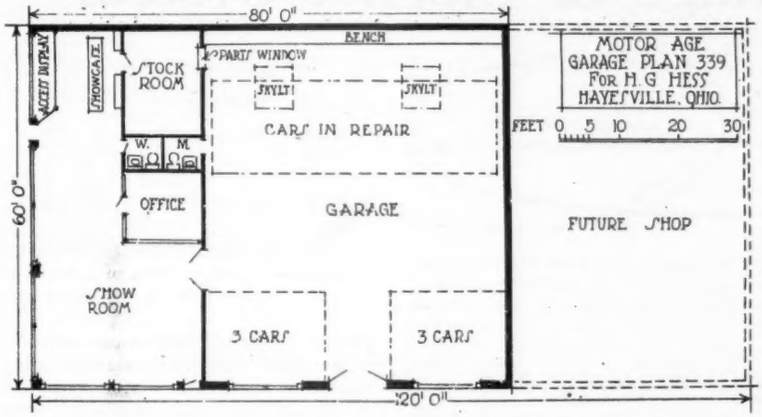
Please publish a plan for a repairshop to be built of tile with a brick front. Will want storage space for only five or six cars to help cover overhead. Will one or two doors be required? Arrange for a work bench and a place to charge batteries. We will not repair batteries. Plan for an overhead track with pulleys for running hoists.—Wm. Kasdorf, 101 Hadley street, Milwaukee, Wis.

You will be handicapped by the narrowness of your space but inasmuch as your lot is on the corner, this will not be a serious disadvantage.

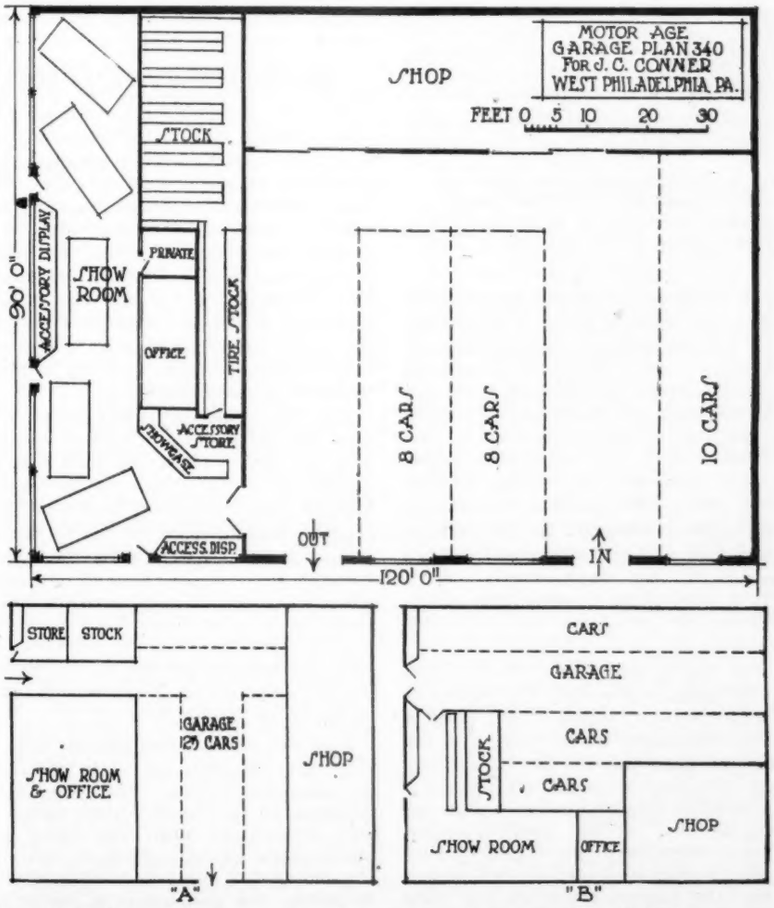
The width of your building will allow you to store five cars in a row crosswise and you can either make the garage space 50 ft. wide and store two rows, or bring the shop partition forward to A leaving space for two rows in the shop. If the shop is made larger, it might be best to have the bench along the side B with cars at the rear and along the side A, leaving a center aisle for work. The cars could be placed along the wall C but would interfere with getting in and out through the working space.



Plan 337—This lot is somewhat narrow for a repairshop and garage but has some advantage in being on a corner. Five cars can be stored crosswise



Plan 339—Not enough information was given by the reader as to just what he needs but the plan above may meet with approval



Plan 340—Above are shown three layouts for a large garage and showroom on a lot 90 by 120 ft.

Not Enough Information

PLAN 339

I have a corner lot 60 by 120 ft. I expect to build a garage about 55 by 80 ft. I might make some living rooms over a part of it. Would be glad if you would furnish plans or suggestions.—H. G. Hess, Hayesville, Ohio.

You have given us so little data that it is almost impossible to make any kind of intelligent layout; about all we can do is to take a blind shot. There is no objection to making your building 55 ft. instead of 60 ft. wide, the 5 ft. will be wasted and the building will be less adaptable.

With the layout above you can add the remaining 40 ft. and move the shop into it leaving the garage section free with space for 18 cars.

Perhaps you do not want a showroom or accessory store. Perhaps you only want a shop layout. We have no means of knowing unless you tell us.

Attractive Garage

PLAN 340

Kindly publish a plan for a garage on a lot 90 ft. by 120 ft. deep. Want an attractive front as I intend securing a good selling car agency and will also carry a line of accessories, tires and tubes. I want to secure the most car space available without crowding. There will be but one main entrance, 4 ft. alley on one side and a side street on the other. —J. C. Conner, 1309 S. 52nd street, West Philadelphia, Pa.

Like many others who apply for plans to this department, you have given us so little information that we hardly know where to begin.

Of course, a garage is a garage, but of all the thousands in the country, we have never seen any two alike with the exception of the big city, storage garages.

You have said nothing about a repairshop and we do not know whether you do not want one or overlooked mentioning it.

In the large layout we devote considerable space to showroom, shop office and store. In the small layout A, which is half the scale of the large one, the division of space is about the same but differs in some respects, while in the small layout, B, the garage is larger and all other departments smaller.

If no shop is desired, the storage space can be increased in the large layout to take care of about 12 additional cars. Should the showroom and store be larger than desired, include the stockroom space in the garage making room for six more cars, or 46 altogether.

Automotive Architecture

IN this department MOTOR AGE aims to assist its readers in their problems of planning, building and equipping, service stations, garages, dealers' establishments, shops, filling stations, and in fact any buildings necessary to automotive activity.

When making requests for assistance please see that we have all the data necessary to an intelligent handling of the job. Among other things we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated, and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

The Readers' Clearing House

Questions and Answers

CONDUCTED BY ROY E. BERG
Technical Editor, Motor Age

Changing Voltage of Electric System

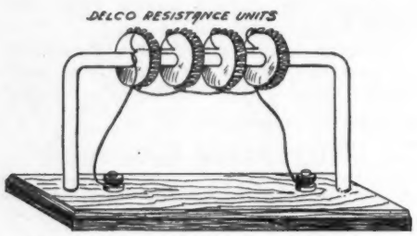


Fig. 1—The suggested method of making a shunt field resistance, using ignition resistance units

Fig. 3—The method of determining how much wire is needed for the resistance unit shown at the right

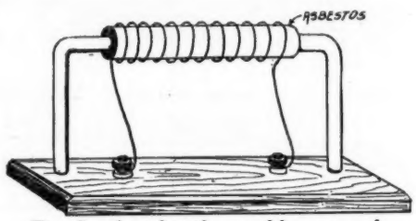


Fig. 2—Another form of home made shunt field resistance

Q—I have a model 43-1913 Oakland with a 24 volt starting and lighting system. I would like to change this to a 6 volt system for lighting and ignition only. Can the same generator and cutout be used? Publish wiring diagram.—Subscriber.

DESPITE the apparent complication of this system, the contemplated change should be very simple for the average automobile electrician using the diagram, Fig. 4, illustrative of all Delco 6-24 volt apparatuc generating circuits. A splendid description together with this diagram appeared in MOTOR AGE Oct. 17, 1918. We cannot do better than reprint it here.

6-24-VOLT, SINGLE-UNIT, TWO-WIRE

This type of electrical equipment was used on the 1912 Cadillac and on the Cole, Hudson, Oakland and Oldsmobile cars during 1913.

The principal units are a two-pole combination motor and generator with a single armature winding which generates at 6 volts and operates as a motor on 24 volts; a storage battery of four groups of three cells each, connected to a special controller in such a way as to permit of series of parallel grouping; a dual ignition system using current from the generator and also providing for ignition from five dry cells. The special controller is mounted in the battery box.

The system is free from grounds. Six-volt lamps are used. The circuit between the generator and the battery is opened and closed by an electro-magnetic cutout. This cutout is mounted above the special controller, and in addition a special ampere-hour meter is mounted in the battery box and serves to regulate the output of the generator. The two-wire system is used throughout. No fuses or circuit breakers are used. A wiring diagram of a system of this kind is shown in Fig. 4.

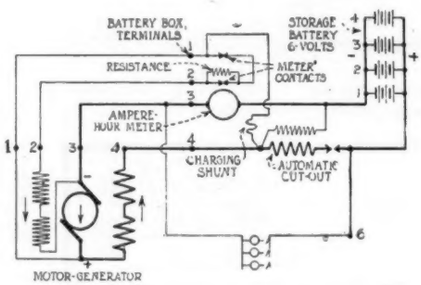


Fig. 4—Diagram of Delco 6-24 volt electric installation. The supplementary resistance is to be inserted in the shunt field regulating line

When the starting switch is depressed it closes the circuit at its two contact points, and the following results are accomplished. The circuit is completed from the 6-volt battery through the winding of the magnetic latch and the series field and the armature windings of the electrical unit, which causes the armature to revolve, and the machine acts as a series motor. No power is transmitted to the engine crankshaft, as the shaft of the electrical unit and the crankshaft are connected by an over-running clutch which is capable of transmitting power only from the engine to the electrical unit.

If the clutch pedal is pressed down now, the gears connecting the electrical unit and engine crankshaft are meshed and the controller thrown over to the 24-volt position, and the series winding of the electrical unit and its armature are connected directly in series with the 24-volt battery. If the ignition button has been depressed, the engine should now start to operate under its own power.

When the engine picks up and runs faster than the electrical unit tends to operate it the starting clutch will slip and the driving clutch on the opposite end of the shaft will take hold and drive the electrical unit. The clutch pedal should be released as soon as the motor fires. When this pedal is released the special controller switch is changed from a 24-volt battery connection to a 6-volt connection, and the starting gears are disengaged.

REGULATION OF GENERATOR OUTPUT

As soon as the engine exceeds a certain speed the generator produces enough electrical pressure to close the cutout relay, which connects the generator terminals to the storage battery through the ampere-hour meter. While the battery is charging the large hand on the ampere-hour meter revolves slowly in a counter-clockwise direction. The small hand on the meter merely serves as a means of determining at a glance if the battery is charging or discharging.

The shunt-field current of the electrical unit can be traced as follows: Starting with the terminal on the electrical unit marked 1 in Fig. 4, then to the terminal marked 1 on the battery box, then to the second terminal from the top on the side of the knife switch toward the battery, through the contact of the knife switch when it is closed, thence to one of the contacts directly above the ampere-hour meter. Terminal 2 on the electrical unit also is connected to one of the contacts directly above the ampere-hour meter, as shown in the diagram.

An inspection of the diagram will disclose the fact that the electrical circuit is completed through the two sets of contacts at the ampere-hour meter and will remain so until the large hand moves back to zero, when it will cause the right set of contacts to open and thus introduce the resistance in series with the shunt-field. A further movement of the large pointer will cause the left set

of contacts to open and thus opens the field circuit.

The introduction of the resistance in the field circuit of the electrical unit reduces the voltage generated in the armature and hence the current it delivers to the battery. When the condition of charge has reached a certain point the voltage of the electrical unit is reduced to practically zero value by opening the field circuit and the cutout immediately disconnects the battery. As the battery becomes discharged the large hand on the ampere-hour meter will turn in a clockwise direction and the contacts will be restored to a closed position.

A careful study of the foregoing and of the battery connections will show that any three of the small battery groups can be disconnected, leaving only one in the circuit, and that that one will function perfectly to the extent of its capacity. Following this reasoning it becomes apparent that the small group of three cells can be replaced with a much larger group so long as the latter does not exceed three cells.

This being true it is entirely practicable to remove the old 24-volt battery completely, replacing it with a three-cell battery of any reasonable size. This brings up the question of the regulation of the generator output which, in its turn, is dependent upon the total area of the positive plates of the battery and upon the service which the latter is to perform. It is recommended that an 11 or 13 plate type battery be used.

Were either of these sizes used for cranking service, the proper charging rate would range between 10 and 15 amp. but as they will be used to carry the comparatively small lighting and ignition load only such rates will be too high and will result in a constant state of battery overcharge with the attendant excessive gassing and disintergation of the plates.

As the normal output of the generator in question ranges between 12 and 22 amp. it is apparent that some means must be devised to reduce it. The simplest, most effective method is the problem. Referring to Fig. 4 it will be seen that the current passing through the fine shunt-field windings of the generator has but two functions, that of magnetizing the generator field poles and actuating the cutout relay and that it does not pass through the battery.

On the other hand, the current passing through the heavy series field windings goes to the battery by way of the coarse winding of the cutout relay and returns to the generator by way of the ampere-hour meter. This is the charging current. Due to the fact that the heavy field winding is what is known as a reversed series—by which it is meant that it is wound on the pole pieces in a direction opposite to that of the shunt winding—it has the effect of neutralizing the magnetism set up by the latter and weakening the fields, holding the generator output within the comparatively narrow limits before mentioned.

Although this limit is considered low enough for the starting battery it is altogether too high for one used for ignition and lighting only and some way of reducing it to a suitable value must be devised. The most logical method is that of reducing the initial magnetizing current passing through the shunt fields.

Fortunately, this system is well adapted to the change, the lead from the binding post 1, on the generator, to binding post 1, on the battery box offering an ideal location for the installation of the necessary device. Our suggestion is that it be cut and a resistance of such value inserted that, at a car speed of 30 m. p. h., the current passing to the battery shall not exceed 10 amp. Of course, at lower speeds this value will decrease but even though it fall to 5 or even 3 amp. it will still be sufficient to hold the battery up to the requirements of the lamp and ignition load.

THE RESISTANCE UNIT

The making of this device will call for the exercise of considerable ingenuity and some experimentation. Two simple, easily made devices are shown in Figs. 1 and 2. To make the first procure 5 ft. of 26 gage, German silver resistance wire. This will be somewhat more than is really needed but allowances are made for error. Connect the full length into the circuit between the generator binding post and the lead wire, after having first disconnected the latter from post.

Next, disconnect the lead from the generator binding post 3, and insert an ammeter in this circuit. The engine is now started. It is quite likely that the full length of the wire will have such a resistance that the shunt fields will not energize and build up. Should such be the case make a loop of the wire, as shown in Fig. 3, and gradually sliding the free lengths of the wire upon each other, increase the size of the loop.

Note at what current value, as shown by the ammeter, the relay points close. It will be found that the actual length of wire through which the current passes is between 2 and 4 ft. Now speed the engine up, to what would correspond to a car speed of 30 m. p. h. If the current value rises above 10 amp., shown by the ammeter, increase the resistance by decreasing the size of the loop.

When the generator output remains steady at 10 amp. at the high engine speed, measure the length of the wire outside the loop. This will be the length needed. In cutting off, a few inches of surplus had best be allowed as there may have been a slight error.

The next step is to bend and thread both ends of a section of ¼-in. rod. After applying four wrappings of asbestos paper between the bends, wind on the resistance wire, leaving a space of about 1-32 in. between the turns. Mount the finished unit on a fibre block securing the ends of the wire to binding posts. The device may be placed in any convenient location, leads being run to it from generator and battery box binding posts 1 and 1.

Likewise the ammeter may be installed on the car instrument panel and connected into the series circuit by means of leads from the generator and battery box terminals 3 and 3 or 4 and 4. Another type of resistance, shown in Fig. 1 is made up of a few ignition resistance units such as are used in connection with ignition coils.

Three or four of these, connected in parallel—not in series—will, probably, give the desired result. Here also some experimenting will be necessary, adding or removing units until the recommended charging current value is attained. Mount the spools on a rod and complete the assembly on a fibre block as in the former case. Spools of the proper resistance may be procured from manufacturers of ignition apparatus.

TAPE UP EXTRA BATTERY LEADS

It is now seen that three pairs of battery leads are idle, one pair only being needed to connect the 6-volt battery. These may be removed or the ends heavily taped. Under no circumstances must they be left unprotected as, should any two of opposite polarity touch, the result would be a destructive short circuit of both the battery and the generator.

All that now remains to be done is to change the light bulbs and the ignition coil to those of the 6-volt rating, should this be necessary, and to disconnect the linkage of the starting switch. This latter for the reason that should the switch be accidentally operated the ammeter would be completely burned out and ruined. If the ampere-hour meter is operating satisfactorily it is recommended that it be retained in service.

Should it be desirable to eliminate it a short length of 14 gage wire connected to its terminals will cut it out of the circuit. The cutout relay need not be altered in any way as there is no reason why it should not function perfectly.

TWO AMERICAN CARS

Is there more than one company manufacturing cars bearing the name American?—L. C. Dutcher, Los Angeles, Calif.

There is some chance of confusing two cars which have the word "American" in their official names. These are the American Beauty and the American Six. The former is made by the Pan-American Motors Corp., Decatur, Ill., and the latter by the American Motors Corp., Plainfield, N. J.

The Readers' Clearing House

THIS department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

TO INSURE PROMPT ATTENTION AND ACCURACY GIVE CAR SERIAL NUMBERS AND NOT MODEL CODE DESIGNATIONS.

Wiring of 1917 Maxwell—Simms-Huff System

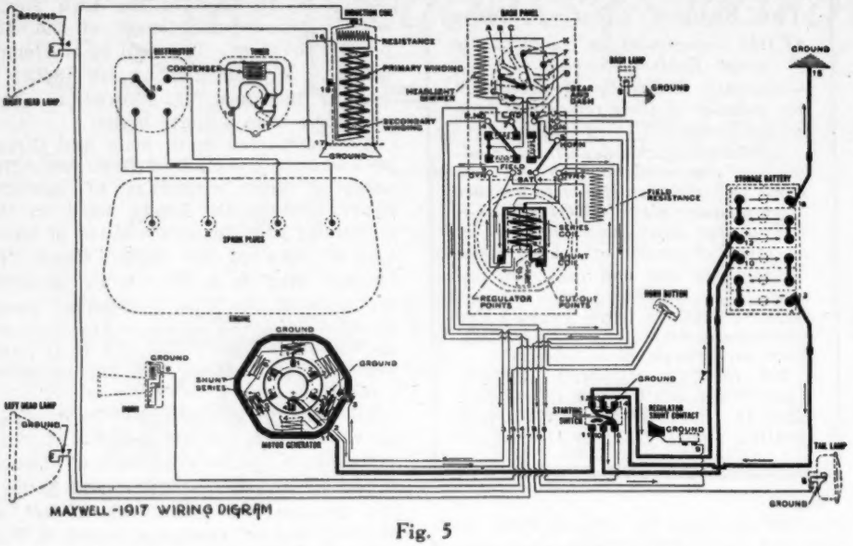


Fig. 5

Wiring Diagram of 1915 Chalmers—26B

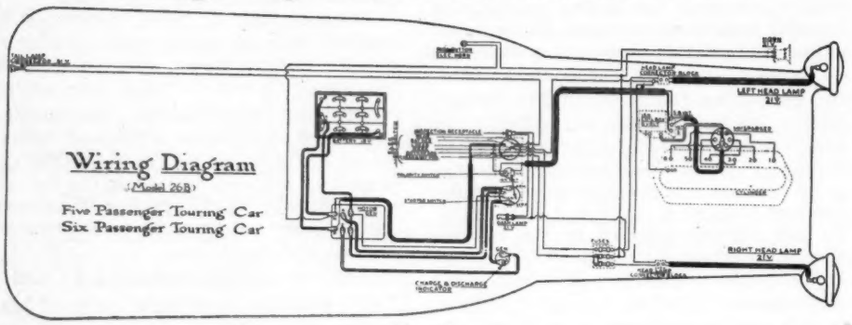


Fig. 6

MAXWELL 1917 WIRING DIAGRAM

Q—How is the ground connection made on a 1917 Maxwell?—F. C. Stroker, Olney, Mo.

Being unable to determine which of the several grounds in this system you refer to we are showing the whole wiring scheme in Fig. 5.

BATTERY PLATE FORMULAE

Will you kindly inform me what formulae are most commonly used in the manufacture of positive and negative plates?—P. E. Lenville, Indianapolis, Ind.

There has always been an atmosphere of mystery surrounding the manufacture of battery plates. Secret formulae are the rule, and the manufacturers guard their secret processes carefully. However, it is no secret that the principal active ingredients are lead oxides of two forms, the red oxide, commonly called red lead and the yellow oxide known to the trade as litharge. It is in the mixing of these with various solutions of acids and alkalis that the secret of plate production lies. Space forbids the publication of a full formula.

CUT-OUT FAILS TO CLOSE

Q—Can you explain the behavior of a 1920 Ford type, third brush generator which acts as follows: Most of the time the cut-out will not operate until it has been closed manually. It then remains closed and generator charges normally until the engine is stopped, at which time the cut-out opens. Occasionally the cut-out will cut in when the engine is started but not often. Decreasing the tension of the spring on cut-out lever does not help matters.—P. S. Staples, Manhattan, Kan.

There are two windings on this cut-out, a coarse and a fine. The fine one is connected to the generator on one side and grounded on the other. Immediately the generator starts, a faint current is set up in this winding which, as it finally becomes strong enough, causes the iron core of the cut-out to become magnetized and attract the armature—the small swinging part which carries the contact points.

As soon as these are closed the current flows around the coarse winding and out to the battery by way of the ammeter. Should the fine winding be broken or become loose at its ground connection there will be no path for the initial current and, consequently, the cutout will not close. Upon closing it manually current will flow through the coarse winding and, magnetizing the cut-out core, hold the armature until the engine is stopped.

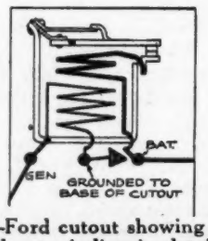


Fig. 7—Ford cutout showing the fine shunt winding in detail

Sometimes engine vibration will cause the points to be brought together. When this occurs, of course, the heavy winding becomes active just the same as though the points had been closed normally or by hand. Then again, should the fine winding be broken but the wire ends not widely separated, vibration will cause them to touch intermittently. Either of the foregoing would account for the cut-out working satisfactorily once in a while. A test of the fine winding will locate the trouble. A diagram of the cut-out is shown in Fig. 7.

HIGH TENSION CURRENT OSCILLATES

Q—Does the secondary winding of the present type battery ignition coil deliver the A. C. or D. C. current? If A. C. current, please let me know in what way it produces this current.—Igleharts' Garage, Madisonville, Ky.

Strictly speaking the high tension current is neither direct or alternating in the general acceptation of these terms. While it is true that it does not flow in one direction at a constant value, neither does it alternate at one frequency and amplitude. The term usually employed to describe it is oscillatory, meaning that it surges back and forth but that each succeeding surge is of less voltage and lower speed than the preceding one until the zero value is reached.

To reply in detail to the latter part of your query would necessitate going into an explanation of the laws of induction as applied to ignition coils. Limited space forbids this but the whole subject is most ably handled in the series of articles on automotive electricity now running in this magazine under the head "How the Electric System Works."

MAGNETO POINT TROUBLE

Q—Can you explain why the first explosions in starting a Titan tractor are so much weaker when the tractor is warm than when it is cold?

2—The K. W. magneto on a Titan tractor will spark perfectly for hours then suddenly quit. Cleaning points with very small quantity of oil and wiggling breaker box will cause it to restart. The wiggling seems to have the most effect. Have seen two of these magnetos, each with about 1,000 to 1,500 hour service, act the same way. Can you explain this?

3—Can new magnets and coil be installed in a 1910 Ford engine? If so, with changes?

4—Could old magnets be recharged with a 6-volt storage battery connected to one pair of magneto coils charging one magnet at a time?—M. Torgerson, Wheaton, Minn.

1—The reply to this question has to do with volunmetric efficiency. Owing to the fact that a cold charge is not so highly expanded as is a hot one the engine when cold takes in a greater volume of mixture and, consequently, delivers a heavier impulse when such charge is ignited.

2—Poor quality points often act this way. Platinum is the only metal that, up to date, has given perfectly satisfactory service. During the war this trouble was very common and was traced to adulterated metal in the points.

3—There being considerable difference between the fly-wheel assembly of the 1910 model and the present model Ford it is impracticable, if not impossible, to make the contemplated change.

4—It is possible that they would be livened up some. That they could be saturated is questionable. Better results will be had with 12 volts.

CHANGING GENERATOR OUTPUT

Q—Would it be possible to install a 6-volt battery instead of a 12-volt on a 1916 Maxwell if the starter was not used? What changes would have to be made?—J. S. Gower, Coffeyville, Kans.

Such a change is entirely feasible. It will necessitate changing the lighting circuits somewhat, simplifying them. Another simpler lighting switch had best be installed. Any good mechanic should be able to do the simple rewiring necessary for this part of the job. Reducing the output of the generator is not quite so simple a matter and may require a little experimentation. Fig. 8 will prove a valuable guide in the undertaking.

The field regulating resistance coil, marked "Field Resistance" will have to be replaced with another having a greater length of wire. Just how much wire will be required we cannot say. However, it will be a simple matter to procure a trifle more than twice as much as is in the present unit and trim off the surplus until a generator output of between 7 and 10 amp. is attained at maximum car speeds. German silver resistance wire should do the work nicely.

AMMETER FOR 1916 CHALMERS

Q—Can an ammeter be installed on a 1915 Model B-26 Chalmers car without changing the wiring? If so, show the connection.—Parksley Marble Works, Parksley, Va.

A diagram of the electrical system used on this car is shown in Fig. 6. The original current indicator, marked "Charge and Discharge Indicator," is of the C. O. D. variety and does not register in amperes.

A new instrument, recently placed on the market by the Roller-Smith Co., 9 Bartley St., New York, is especially designed to take the place of old type units and is guaranteed to withstand heavy current discharges for reasonable lengths of time. The connections are the same as those of the instrument you now have.

It is possible that, in installation, you may get the connections reversed. This will do no harm and can be remedied by reconnecting in the proper manner.

ENGINES

OIL GAGE FAILS TO REGISTER

Q—The oil pressure gage on my 1915 Dodge Brothers car does not register correctly. When the car has stood all night and is started in the morning the gage will show 1 lb. at 10 to 15 m. p. h. for about 5 or 6 miles; then it stops entirely. Have installed new pump vanes and springs with no results. The engine gets oil but no pressure. Would holes in feed pipe over cams be worn enough to let oil flow too freely, therefore reducing pressure? Could I use the air gage in place of the oil gage as I have installed vaccum tank on this car and do not use air pressure any more.—George Dittiacur, Hammondsfort, N. Y.

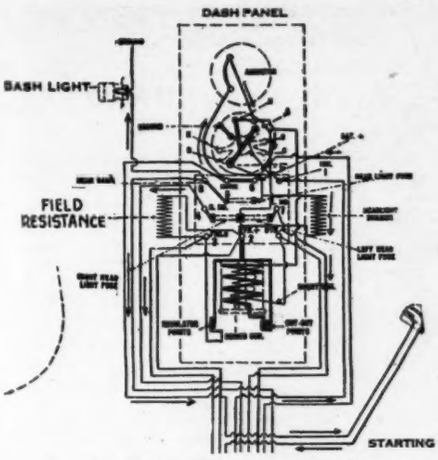


Fig. 8—Simms-Huff cutout and regulator. It is recommended that the present field resistance be replaced with one of a higher value

This would seem to indicate wear in the pump. If all conditions are normal, no clogging or loose connections, the gage indication can be increased by adjusting the ball check in the elbow on the right hand side of the engine just forward of the lower corner of the valve chamber cover. Increasing the spring tension will have the effect of increasing the pressure in the line running to the gage. The sectional view shown in Fig. 9 will prove of assistance. We cannot say whether or not the air gage will function satisfactorily. Only a few moments will be required to try it.

OIL PUMPING PROBLEM

Q—What is the best grade or body of oil to use in an Essex four driven over 9,000 miles? Car has the same pistons and rings that came in it.

2—The car throws a little oil past the rings, although the power is good, but I have to clean out carbon about every thousand miles. Compression is good, ignition correct and the oil pump set for a short throw to cut down the oil fed to the engine In this condition what causes oil pumping? Is it the oil used or simply wear, or is it natural to a high-speed car? Have heard that many high-speed cars throw oil.

3—Last time engine was opened the rings were found all right. Do rings wear out inside of 10,000 miles? Would you recommend American hammered rings or soft iron rings?—Harvey T. Templeton, Room 203 Randall Bldg., Dallas, Texas.

We are rather of the opinion that this is not nearly so much a question of lubricating oil viscosity as it is one of piston fit. The fact that the clearance is too great does not necessarily indicate excessive wear but rather that the initial clearance was too liberally calculated.

The earlier model cars were turned out with clearances of .008 which rapidly increased to .012. In most instances this was corrected by the manufacturer, pistons of .006 clearance being substituted.

It is true that pistons and rings should give better than 10,000 miles of service before being badly worn and we believe that they have done so in this case.

If the car is still within the meaning of the factory warranty it is quite possible that a satisfactory adjustment can be arrived at.

We have had quite favorable reports of the brand of ring mentioned and have no doubt that it, or any of the several reliable brands on the market, will give very satisfactory service if properly installed.

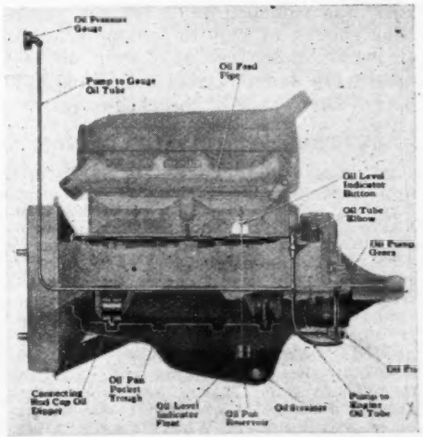


Fig. 9—Dodge oiling system. Heavier tension on the elbow check valve will make the gage read higher

INTERCHANGING ENGINES

Q—Can a Chevrolet model 490 engine be used in an 8-cylinder, model 16 Jackson? What changes would have to be made to do this? Would this engine give me enough power?—L. F. Clark, Ponca City, Okla.

We cannot state whether the installation can be made or not without a comparison of the working drawings of both cars. Changes of this kind are not advisable because it involves considerable expense and many complications will arise that are not apparent when the job is started. In the cases where the same kind of an engine or any unit is the same the interchanging can usually be worked out satisfactorily and with very little trouble. In the case mentioned the units are so vastly different that the installation would probably prove unsatisfactory and would not be worth the expense.

FORD ENGINE FARM POWER PLANT

Q—Have an old 1908 Ford, the engine of which is in fairly good condition and I had thought of making a stationary farm engine of it. Do you think this would be practical? If so, where could a suitable governor for it be obtained?

2—How would you attach a pulley and do you think the present method of cooling would be sufficient?

3—What other changes would be necessary?—Stanley C. Gile, Franklin, N. H.

Such an outfit would doubtless give good service for a long time. The following concerns supply governors for Ford trucks and Fordson tractors:

O'Maley Tractor Co., Kansas City, Mo.

Dell & Co., Detroit, Mich.

The Tractor Appliance Co., Shelbyville, Ill.

You will probably find it necessary to install a large tank or barrel, connecting it in series with the regular circulation system.

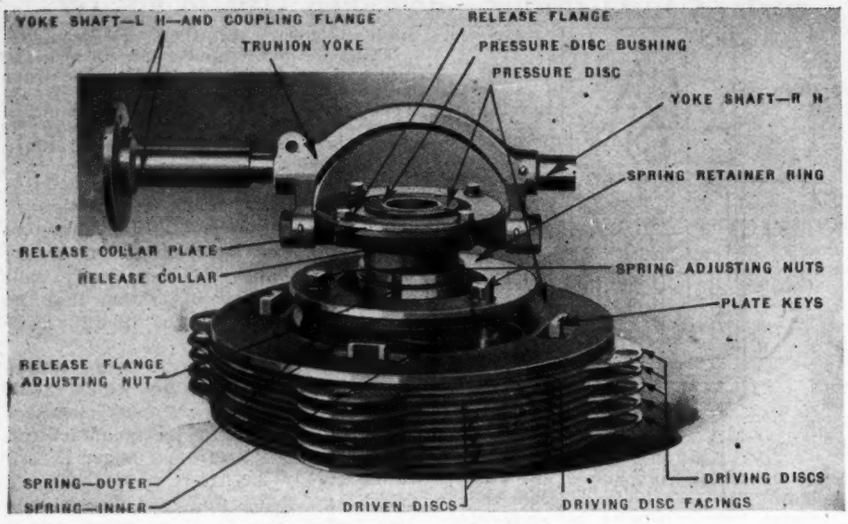


Fig. 10—Clutch used on 1914 Lozier

LOZIER CLUTCH ADJUSTMENT

Q—Publish diagram showing the construction of the clutch on a 1914 Lozier. Advise how to adjust same.

2—Where can parts for this car be obtained.—Willis Groshong, Oceanside, Calif.

(1)—This clutch being of the dry plate variety, adjustment should not be needed. There is a tendency for it to drag if the keys on the driven drum become worn or roughened. This may be remedied by dressing both keys and the keyways in the small discs with a fine file. A diagram of the unit is shown in Fig. 10.

The throw of the clutch pedal can be altered by removing the bolts from the flange on the yoke shaft, marked L H in the diagram, and moving the flange one bolt hole, in relation to another flange, not shown, in whichever direction desired. This will lengthen or shorten the pedal throw. It is quite possible that the friction material facings of the discs have become worn. If this is the case the logical remedy is to reline them with any of several brands of material offered on the market.

(2)—The required parts may be procured from the Standard Motor Parts Co., Newcastle, Ind.

TAPPETS PUMP OIL

Q—Have installed new valve tappets and guides on a 1913 Mercer, model 35-J and the oil works out between the tappets and the guides. Also, when engine is pulling idled down on high gear, we obtain a jerky motion. It does this on a level road. Kindly advise remedy for this.—B. J. Deisenroth, Fremont, Ohio.

One way to stop the oil from working out is to cut a groove on the inside of the guide near the top and then cut a groove right down the side of the guide to drain the oil back into the pan. The irregular running is probably caused by a poor fitting valve stem which permits air to enter around the stem.

It would be advisable to make a careful check of the manifold connections to see that they are air tight and then make careful adjustment of the carbureter Another common fault that results in irregular motor performance at low speeds is a too wide setting of the spark plug points. There are so many factors that might give rise to the effects mentioned that it is extremely difficult to more than suggest a few remedies.

SPARK PLUGS FOUL

Q—Can you advise the trouble with a 1918 Ford that runs well at all speeds and has plenty of power, but misses on No. 1 and 4 cylinders, due to a badly carbonized plug? Am using old plugs and they have to be cleaned every 100 miles or oftener. The missing always occurs when the car is first started after having been used. Am I experiencing oil troubles? The valves have been ground and the carbon cleaned recently. Am using Polarine medium oil.

2—Have driven a Model F, Indian motorcycle 25 miles with the exhaust valve in the closed position. The push rod became loose and would not even touch the valve stem, and still the engine fired and exhausted on both cylinders. What is the trouble?—Ben H. Neundorf, Medford, Wis.

The indication seems to be worn rings or pistons, or both, with consequent oil pumping. In reply to the last question we would say that there was really very little cause for complaint. It is quite likely that the momentum of the push-rods was sufficient to knock the valves open enough to keep the engine running. It is doubtless true that they did not open very far but still far enough to permit the escape of the exhaust gas.

BETTER NOT CHANGE DESIGN

Q—Have a six-cylinder, 3½ by 5¼, 7-N Continental engine in a 25-ft. Vee bottom runabout. With cast iron pistons, 1¼-in. Rayfield carbureter and with the engine temperature at 130 deg. Fahr., its maximum speed is 1675 r.p.m. The engine is equipped with an oil cooler and has the regular oiling system. Would it pay to change this system to full force feed? If so, what would be the oil pressure needed? Would I get more r.p.m. by changing the valve timing and enlarging the carbureter? If so, how many teeth shall I advance it and what size carbureter will I need? What are the valves made of? Is there anything else I can do to add to the speed and reliability of this engine?—G. E. Lammert, Culver, Ind.

Non-interference with the original design of standard equipment cannot be too strongly urged. We gather that this engine is giving satisfactory service with the possible exception that the speed developed is not quite all that is desired. If this is true we believe it will be the part of wisdom to not engage in any extensive experimental work. A trifle sharper setting of the cams may result in a slightly increased engine speed and will cost nothing to try.

It may interfere somewhat with flexibility of control but this may well be sacrificed if the increased speed is the more desirable. Advancing the camshaft setting by not more than one tooth will accomplish all that can be expected in this direction.

The size of the carbureter is determined by several factors, piston displacement, port areas, etc., which you cannot alter. Therefore, you had best be content with the carbureter supplied with the engine, or, if not entirely satisfied, with another make of the same capacity. We do not recommend a reconstruction of the lubrication system. The valves are of steel throughout.

CAR DRIFTS TO THE LEFT

Q—What is the easiest and best way to remove carbon from pistons?

2—Publish diagram of the Porter automobile.

3—A car, when traveling at a rate of 45 m.p.h., swings to the left. The wheels are all in alignment. What would cause this?—C. Hochgreve, Green Bay, Wis.

1—The easiest way to remove carbon is by the oxygen burning process. The best way is by scraping, as this is, without doubt, the most thorough.

2—We do not understand this request. Which diagram is desired, wiring, oil, circulation, or cooling?

3—There are several things which will tend to make a car drift to either right or left at high speeds. Among these are variations in tire size, owing to age and stretch, slight difference in the flattening of the springs, considerable difference in the wear of the spring shackles and an almost imperceptible springing of the front axle.

THE "MYSTERY" AGAIN

Madison, Wis.

Editor, MOTOR AGE—I read in MOTOR AGE, the "Mysterious Engine Trouble" query. It was in the April 28 issue. I would like to suggest a few things. Why monkey with the valve timing if the engine runs at all well at a nominal speed? No doubt the valve stems are worn badly, at least worse than he thinks, and they suck air. Naturally, he has to give his engine a heavier mixture to overcome this. Burning this rich mixture makes the engine heat and also thins the oil very rapidly, as he mentioned.

Tell him to pour oil down onto the valve stems when the engine is idling and the chances are he will locate his main difficulty. If the stems do leak, the engine will load up when the oil is poured on and if it does this, that settles the argument. Also, I suggest setting up the points good and close. Spark plugs as well.—Roy Levenick.

The fact that this trouble occurred suddenly would rather lead one to suspect that gummed piston rings are having an influence. This is by no means uncommon when certain of the substitute fuels are used.—(ED.)

HOW THE ELECTRIC SYSTEM WORKS

ARTICLE VIII

(*Continued from page 32*)

of the lamps refuse to light the trouble is not in the individual circuits but in the main circuit from battery to switch. To determine the exact location of the trouble, a portable six volt trouble light is most convenient, and the first test to make would be at the ammeter, assuming the starting motor is working, as this would show the battery to be O.K.

With one of the test lamp wires on the ammeter and the other on the frame of the car, the test lamp should light, this test being made on both of the ammeter terminals, one at a time. If a light is obtained on one terminal and not on the other it indicates an open in the meter. If neither of the meter terminals is alive, and there is current at the starter switch the wire from the starter switch to ammeter is obviously open, the trouble usually being at the terminals. If this wire is open and it is difficult to find the trouble it is often easier to replace the wire with a new one, than to find the trouble.

If current is getting to the ammeter the next test to make would be at the lighting switch, and if this shows no signs of life the wire from meter to this switch is apparently open. If the test lamp lights when connected to the center terminal of the lighting switch, the switch should be turned on, and the other terminals tested to see if the switch makes contact. The switch would have to be entirely burnt out to affect all of the lights.

We will now assume that the left terminals at the fuse box are all alive as shown by the use of the test lamp but that the lower fuse which takes care of the tail light current is blown. It would now be well to connect the test lamp across the fuse clips, with the tail lamp plug removed from the lamp, as a light will now indicate trouble in the circuit, usually due to the insulation being rubbed from the wire, so that the wire makes contact with the frame of the car.

If such is the case, the wire should be traced from the fuse box to tail lamp and it may be found that the wire is being cut by the corner of the frame, or in some such way is making a connection to ground which explains the blowing of the tail lamp fuse.

With this condition remedied and the wire taped up it is now safe to put in another fuse. If there is no trouble in the wire and a new fuse is installed without causing the lamp to light, the bulb may be burnt out, and if this is O.K. it is possible that the wire to tail light is broken inside the insulation.

This can also be tested by using the test lamp connected from ground to the center of the plug that goes in the lamp if single contact plug is used, or across the two contacts if double contact plug is used. If tail lamp wire, fuse and bulb are O.K. a check should be made to see that the tail lamp is grounded and that the socket connections at the lamp are in good order.

If trouble is found in the side or head lamp circuits, the method of locating it is similar to that described for the tail lamp circuit, except that both lamps being out usually means that the trouble is at the fuse, or due to a ground, or due to an open in the wire between the fuse box and the point where the current divides to go to each lamp.

One lamp only being out shows the trouble is not in the fuse but in one branch of the circuit only, indicating a burnt out bulb or poor connection at or in the lamp plug or socket.

Generator Troubles

To check the operation of generator before it is taken from the car it is helpful to close the cutout points by hand and at the same time watch the ammeter on the car, as the current drawn usually indicates the general nature of the trouble. If the upper generator brush (for generator shown in Fig. 1) is lifted and the cutout points closed, current should flow through the field winding, giving an indication of 2 or 3 amp. for the average generator. If no reading is obtained, it shows the field circuit is open, possibly due to the field fuse being blown or making poor contacts at the clips, if the generator has a fuse in this circuit.

If the field circuit is O.K. the upper brush should again be dropped on to the commutator and the cutout points again closed. The combined field and armature current should now be about 15 or 20 amp., which can be observed on the meter. With field and armature circuits apparently O.K. the engine should be run with the cutout held closed. The heavy discharge current will gradually decrease as the engine speeds up and should cause the needle to go to the charge side of the meter. If racing the engine will only bring the meter needle about to zero, it usually shows a shorted armature, or other armature defect.

If the generator charges O. K. when the above tests are made, but will not charge in ordinary operation, it is either due to defective cutout, or to the generator failing to build up by itself. To see if the generator is doing its part, it is well to use a voltmeter connected from the generator terminal to ground, with the engine running slowly. If the voltage comes up to 7 or 8 at moderate speed and continues to rise to 12 or so, it indicates that the fault is not in the generator, as at about 7½ volts the cutout should have connected the battery to produce current to battery instead of further voltage rise.

If no appreciable voltage is obtained from the generator it shows that there is a poor connection in the machine which prevents the slight voltage produced by the residual magnetism from sending enough current to the fields to increase the voltage. Such trouble is often found in connections between field coils, or in glazed or oily brushes, or in a brush in which the shunt or pigtail is making poor connection.

If the generator does generate O.K. the next test should be made with the voltmeter connected at the cutout switch to see if the generated voltage is getting to the switch, and if no voltage is obtained here, there is probably a break in the wire that grounds the frame of the car.

If voltage is obtained at the cutout and it fails to operate, the shunt coil is probably open, unless the spring tension is found to be abnormally great or the air gap too wide. To check the winding the wire should be removed from the generator and the cutout points closed and allowed to open. A faint spark at the points would show current had been flowing through the fine winding; this current is usually too small, however, to show on the ammeter, but can be detected by using about a 3 amp. test meter, connected in between the regular ammeter and the cutout switch.

A reversed winding in the cutout is detected by a vibrating action at the points when the generator tries to charge the battery, and by an abnormal tendency for the points to stick shut when the generator stops, due to the combined action of the shunt and series coils acting to hold them.

NOTE—The next article will be devoted to the subject of ignition principles, which, while the same in a Bosch high tension magneto as in a Ford coil, are but little understood by the average repair man. When their simple basis is grasped, however, the different systems are found to be but detail variations of the same simple rules and laws.

GENERATOR REGULATION

Kindly explain the practical reasons for and adjustment of the third brush on lighting generators as used on most of the cars of today.

This subject has been treated of in the columns of this publication exhaustively several times, in fact to such an extent that no great amount of space can be devoted to a reply in this department. Suffice it to say that the function of the third brush is to hold the current output to a value which will not cause the battery plates to heat and disintegrate. Your query is timely as, in this issue the problems of generator regulation by means of natural field distortion are explained in a plain simple manner in the article appearing under the head "How the Electric System Works."

WILLYS-KNIGHT COMPRESSION

Q—Advise the compression and the pounds per square inch in cylinder at point of explosion in the model 84 Willys-Knight. The cylinder is 4⅛ x 4½.—R. L. McGugin, Washington, Iowa.

We have no definite figures available on this but it is very safe to calculate the compression pressures as varying between 45 and 60 lbs. per sq. in. with wide open throttle.

The Accessory Show Case

New Fitments for the Car

Newton Timer

The Newton timer is designed with a hollow, aluminum offset arm on the top of which are numbered terminals, to which the lead wires are connected. The advantages of this are that the wires are kept out of the oil and grease and away from the fan belt, the connections are plainly in sight and it is said to be much cleaner for the operator. A contact brush of special bronze is used. This is claimed to be electrically correct and will not arc. Due to the special design of the contact assembly, the brush is dragged over the best bone fibre, but this action is claimed not to wear the brush or injure the fibre. Newton Motor Co., 830-831 Old South Building, Boston, Mass.

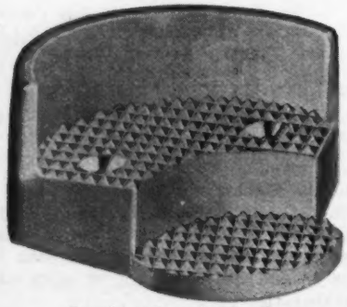
Combination Heel Plate

This plate is so designed that the driver's foot is always in a restful position. It is a combination plate, having an upper and lower heel rest. This plate prevents wearing the carpet and floor board and can be attached in a few minutes with two small wood screws. It is made of aluminum, highly polished, and comes complete for 90 cents. Lexington Motor Sales Co., Indianapolis, Ind.

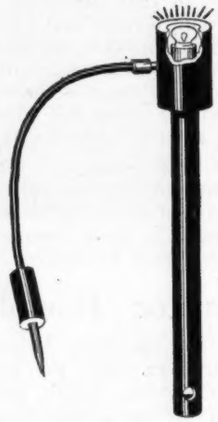
Oil Cooler

A very simple and effective device which can be bolted to the bottom of the engine crankcase in place of the present pressed steel inspection plate on the Ford car, has been placed on the market by the Adamson Mfg. Co., East Palestine, O. A considerable reduction in the temperature of the lubricating oil is claimed to be maintained by the continuous circulation of oil through this cooler, and it is also claimed to prevent burned out bearings, short circuiting of the magneto, fouling of spark plugs and carbonizing. Price $5.

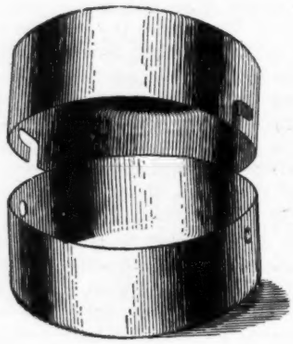
Oil cooler



Combination heel plate



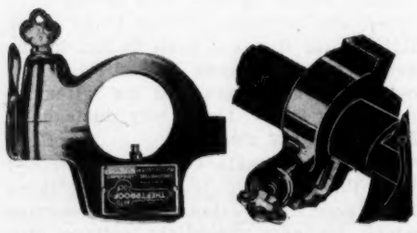
Thompson battery tester



Inner tube box

Inner Tube Boxes

Martin's inner tube boxes are made of two drawn steel shells. The tube should be rolled up with the valve stem on the outside and placed in the box with the valve stem projecting through the hole in one side. Fasten one side of the cover to the valve stem and the other to the lug opposite, and then pump a few pounds air pressure in the tube. This not only fills the entire space in the box and protects the tube from chafing, but indicates when it is ready to be used whether or not it is a good tube. Prices from $1.50 to $2.50 depending upon the tube sizes. The Martin Metal Co., Wichita, Kan.



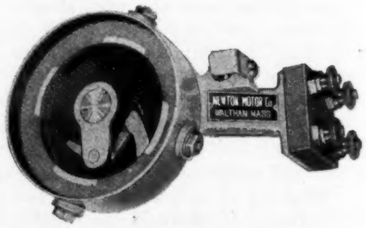
Simplex theftproof lock

Thompson Battery Tester

This instrument can be conveniently carried in the vest pocket and will tell at any time the exact condition of the battery, and the exact amout of energy stored in each cell. By submerging the base of this tester in fluid in the cells a negative contact is made. Then by placing the steel prod on the positive pole of the battery, the circuit is completed and the electric bulb in the head of the tester flashes the amount of energy in each cell. If the cells are fully charged, discharged, undercharged, short circuited or over watered, the tester will indicate this, it is claimed. Price $3. Thompson Battery Tester Co., Greensburg, Pa.

Simplex Theftproof Lock

The Simplex theftproof lock consists of a neat nickle-plated ring, attached permanently and rigidly to the steering post of an automobile. When the lock is in a closed position, a strong case-hardened steel pin passes through the outside steering column into the steering tube and holds the steering gear so that the position of the front wheels cannot be changed. This prevents the car from being towed. A Corbin cylinder lock is used and it can be locked or unlocked in a second's time right from the driver's seat. It is self-adjusting, it being only necessary to close the lever, and turn the key. The moment anyone attempts to turn the wheel the pin snaps into place and the front wheels lock in "straight ahead position." Retail price $15, Simplex Corp., 2214 S. Michigan avenue, Chicago.



Newton timer

Service Equipment

Time Savers for the Shop

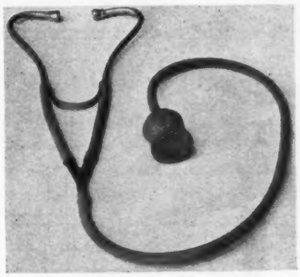
Hy-Speed Drilling Machine

Among the new features of the Hy-Speed drilling machines are the following: Single pulley, direct overhead drive, and dry plate clutch operating in connection with external clamping adjustable air-cooled brake. By means of a single handle directly in front of the operator the machine can be instantly started and stopped. The elevating mechanism to the table is so arranged as to allow taps, etc. to pass through the center of the table.

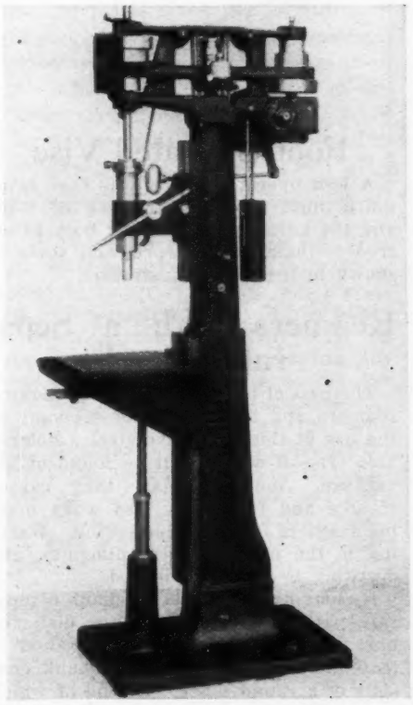
This combined with the use of quick release chuck, allows tapping without reversing at high speeds. Spindle speeds are controlled by a handle on side of column. The automatic power feed and automatic tapping attachment can be arranged on any spindle. Aluminum pulleys are employed throughout. The pump and tank is a separate unit attached to the base of the machine. Cincinnati Hy-Speed Machine Co., Cincinnati, Ohio.

Knock Tector

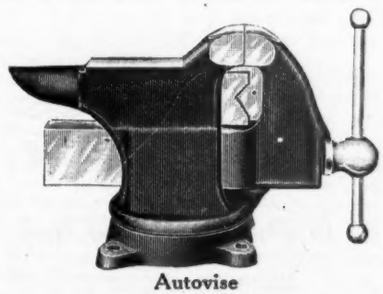
A very recent invention is the Knock Tector, an instrument devised principally for locating trouble in automobile engines, bearings or gears. The purpose of this instrument is to ascertain accurately and with certainty the origin of sounds which are made with some moving defective part of mechanism, or an improperly adjusted or worn out part. In appearance it is very much like a doctor's stethescope and is used in very much the same way. The ear tips on the tube are placed so as to permit them to enter the ears thus only the sounds transmitted directly through the tube from the instrument can be heard, and the vibration and resonance from surrounding parts does not interfere. It is manufactured by the E. R. Benson Mfg. Co., Portland, Maine. Price, $5.



Knock tector



Hy-Speed drilling machine



Autovise

Norton Regrinding Machine

A machine adapted for the regrinding of crankshafts as well as the grinding of pistons, piston pins, valves, etc., has just been placed on the market by the Norton Co., Worcester, Mass. With a swing of 18 in. and a distance between the centers of 55 in. it will accommodate practically all makes of crankshafts and with 12 work speeds provided, efficient grinding can be performed on work of small as well as large diameter.

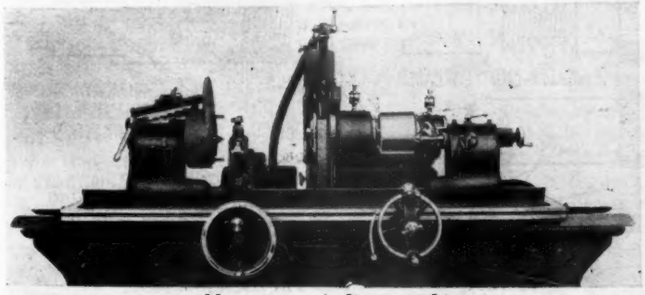
The wheel slide is equipped with a 26-in. diameter grinding wheel so that ample clearance will be provided when grinding crankshafts for long stroke engines. A large capacity pump is supplied which is driven directly from the overhead works. As part of the regular equipment of this machine a combined center and valve face grinding attachment is supplied. An adjustable end block is also furnished in order to provide for the different types of crankshafts.

Expansion Line Reamer

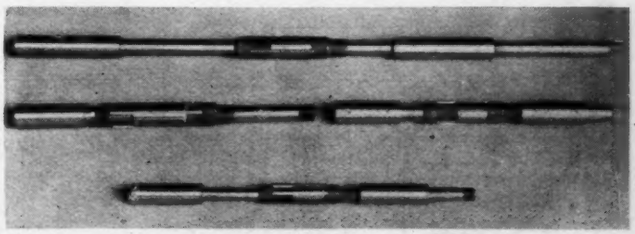
The purpose of the New Britain expansion line reamers is to meet the demand for a high grade, accurate expansion line reamer with pilots reaming two or more holes in exact alignment. They are made with one or two pilots to suit different conditions, and are manufactured in 17 sizes to ream any size from 15-32 to 4 1-16. The expansion of each reamer is claimed to be from .010 to .020 of an inch over the listed maximum size, permitting the grinding of blades many times before replacing is necessary. The six blades are made of a fine quality tool steel and are staggered in the alloyed steel body so as to eliminate chattering. The New Britain Tool & Mfg. Co., New Britain, Conn.

Autovise

A swivel vise which is especially adapted for automotive repair work is shown in the illustration. It is substantially made and is provided with removable pipe jaws. The price of the vise with 3-in. jaws is $13 and the removable pipe jaws for this size $1.30. This autovise is a product of the Rock Island Mfg. Co., Rock Island, Ill.



Norton regrinding machine



Expansion line reamers

The Automotive Repair Shop

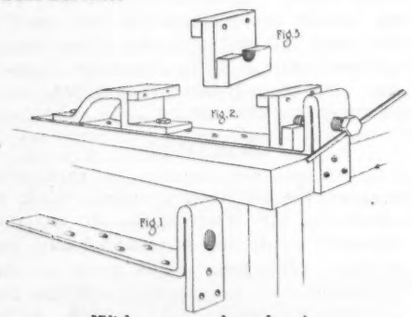
Practical Maintenance Hints

Fuze Tester for the Shop or Garage

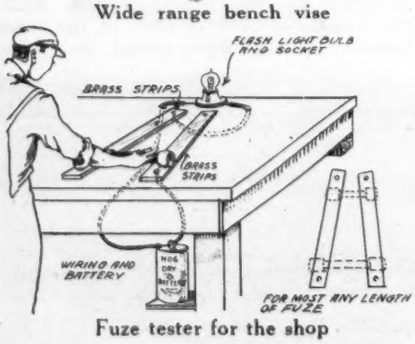
A simple tester to prove conclusively to the purchaser of a fuze or to indicate to the mechanic that a fuze is good or defective at a glance consists of two strips of brass placed on the top of a counter, bench, or wall with the strips so placed that the space at the upper and lower ends is a variable distance. That is the strips are slanted. At the upper end a small test lamp wired to one strip and to a battery is out of circuit until a fuze is placed between the strips, the other of which is wired to the battery. When arranged as shown any size fuze is tested immediately. One dry cell will serve as a battery where a small one cell lamp is used in flush lights.

Wide Range Bench Vise

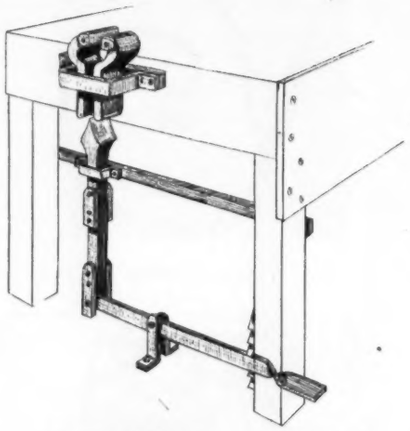
This vise will take 24 in. between the jaws. Any shop man can readily see what a handy thing it is to hold different parts while assembling or dis-assembling, tapping holes, and performing other work on large castings, parts, etc. The vise is simple to make and is best made of ¾ by 4 in. bar stock. It consists of three parts, two jaws, and a frame or body, this being made in one piece to set into the bench top. It is best to form the support for the jaw screw. A series of holes are drilled and tapped in it for the securing of the rear jaw at any desired place. The vise should be bolted near the end of the bench to give best service.



Wide range bench vise



Fuze tester for the shop



Foot Operated Vise

A foot operated bench vise that saves much time in quick gripping of work and the advantage of having both hands free to handle the work and tools is shown in the above illustration.

Reamers with a Separable Shank

The best of tool steel is used in making reamers and for reasons of economy in the use of this expensive steel a detachable type of socket will be found of advantage. Another detail that causes trouble and frequently loss when making reamers is due to tempering. Warping is the most frequent difficulty, and cracking is also experienced.

By making the socket or shank a separate part, only the broken or distorted part is a loss. An effective method of fastening the reamer to the shank consists of a round block, one end of which is cut for the insertion of a taper pin in the shank. The end of the reamer, which is threaded, is screwed into the shank with the round block in place and the pin is driven in. Driving in the pin locks the parts of the tool, yet these are as easily separated by driving out the pin.

Keeping the Ford Clutch From Dragging

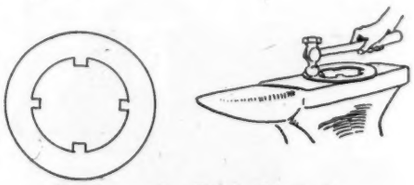
When the plates of the Ford clutch become worn so that there is contact over the entire surface when the clutch is in neutral it is found that they are liable to refuse to separate, and will cause creeping.

A temporary cure for this is to pien one-half of the plates by putting them on an anvil and striking them one sharp blow on each side. This gives the plate a slight curve so that when assembled the clutch can be compressed slightly, and will separate of its own accord.

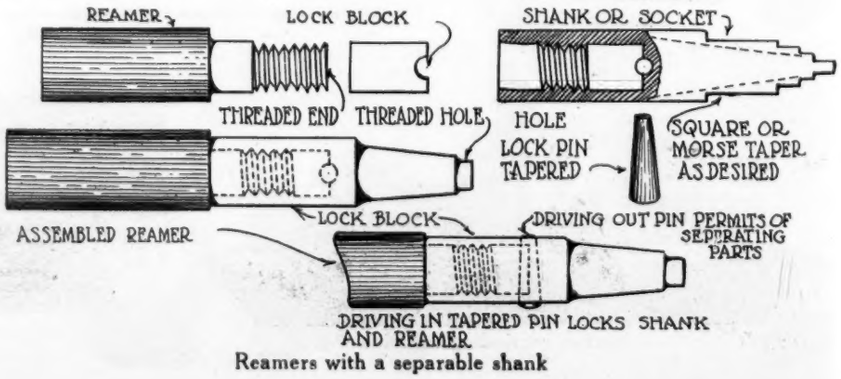
This operation usually gives the plate an expansion of between 1/32 and 1/16 in., which is sufficient to break the suction of the oil and free the clutch. This will not cause the clutch to slip when in high gear.

Turning Over Stiff Engine

Frequently, after a Fordson tractor engine has been overhauled the bearings are tight and the engine cannot readily be turned over. A device for starting and running in such an engine can be made by fitting a small belt wheel or pulley with a 4-in. face to a 1-in. diameter shaft 16 in. long. This device is to replace the starting crank. With it we have turned over a stiff Fordson engine with another tractor by running a belt from the pulley of the latter to the running in device on the engine which is to be run in. Edwin Perry, Charles City, Ia.



To keep the Ford clutch from dragging



Reamers with a separable shank

Law in Your Business

By Wellington Gustin

At Your Service

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer, but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted to him.

Complaint on Repair Bill Months After Delivery

I repaired a car in my garage nearly four months ago. The owner has refused to pay the bill stating that it was too high. However, he did pay $10 on account immediately after he received the bill, but the remainder, $40, I have been unable to collect.

His chief claim is that the bill is too high but he only made that claim after I pressed him for more funds nearly three months after the job was delivered. That was the first intimation I had that the bill was considered too high. This he did not state when he first received the bill.

Secondly he claims he did not instruct me to do certain things that have been done on the car, that is he admits that the bill is not too high in view of what has been done on the car, but adds that he did not tell me to do these things.

The trouble with his car was clutch trouble. It is almost impossible to get a gear in good condition unless the car is running so that the working or not working of the clutch can be observed and it was necessary to get the engine running first which involved considerable trouble and expense, such as charging the battery, etc. Cranking of the car caused me to injure my hand to the extent of being unable to work for a week so I decided to have the battery changed. Another angle in the case is this, he is not the owner of the car, the car is furnished him by an organization and they allow him $15 a week for repair and upkeep. The organization is the owner of the car and an appeal to them for the payment of the bill brought no result. They only called attention to the fact that the individual was allowed a certain amount of money for its repair and upkeep.

1st.—Can I sue the individual for the balance due? ($40).

2nd.—Can I attach the car? Payments on the car still amount to over $500 from previous owner.

3rd.—Can I attach his salary for that amount?

A new clutch was installed, consuming forty hours labor at $40. These 40 hours include all other work done on the engine, wheels and electric system and fuel system which was full of water and ice and the switches corroded.—Stearns Garage, Rubber City.

The facts that the customer paid $10 on the bill immediately after its receipt and that he complained of the job three months after it was finished is strong evidence that the work done by you was satisfactory and accepted by him as such. However, it is not absolute proof. It may be that the customer discovered defects after delivery and acceptance of the work, and if such be true, then the fact that he had accepted and made a payment would not preclude his making a later discovery of defective workmanship and material employed.

His claim that your charges were too high needs a bit of explanation. Your claim rests on agreements, expressed or implied. Of course, if there was a complete express agreement you are bound by it, and if you proceeded to do too much work which is not within the agreement then you could not recover for it. Where the terms used in expressing the agreement may include the additional work as a necessary part of the whole then the customer would be bound to pay for it. If in doing certain work you are compelled to do certain minor work, etc., the law will imply a promise to pay for this extra work. There is an additional security in law for the repairman in these kind of cases in the rule that one may not take the benefits to be derived from such repair work without making adequate compensation therefor. To do so would be enrichment of the car owner at the expense of the repairer. A court will attempt to avoid this. Regarding your queries:

1st.—You may sue the individual for he is personally liable as the one who contracted with you.

2nd.—You may not attach the car, as you have no grounds for attachment.

3rd.—You can reach his salary by attachment or garnishment proceedings.

BUYER, NOT IN DEFAULT, MAY RECOVER MONEY PAID UNDER CONTRACT

In a decision from the Supreme Court of New Hampshire, the facts appear to have been that after a contract of conditional sale of an automobile was made, and while the buyer was not in default, the seller took the car from the buyer's possession and refused to return it until the buyer had paid the balance of the purchase price, which was not then due. The buyer was willing to continue and pay under the contract if he could have the car, but the seller insisted upon retaining possession. The buyer brought suit to recover the sum of $517 paid on the purchase price. Upon these facts the court says the buyer had an undoubted right to treat the contract as rescinded and recover the money he had paid.

The Proposed Illinois Garage Keepers' Lien Law

DUE to the failure of the Illinois lien law for garagekeepers which was recently held unconstitutional and void, the Illinois Garage Owners' Association and the Chicago Garage Owners' Association have brought forward a new bill in the Illinois legislature for the better protection of the garage owner. This bill was introduced by Senator Dailey, ordered printed and was referred to the committee on judiciary. This bill seeks to avoid the pitfalls of the former statute now declared invalid and is entitled:

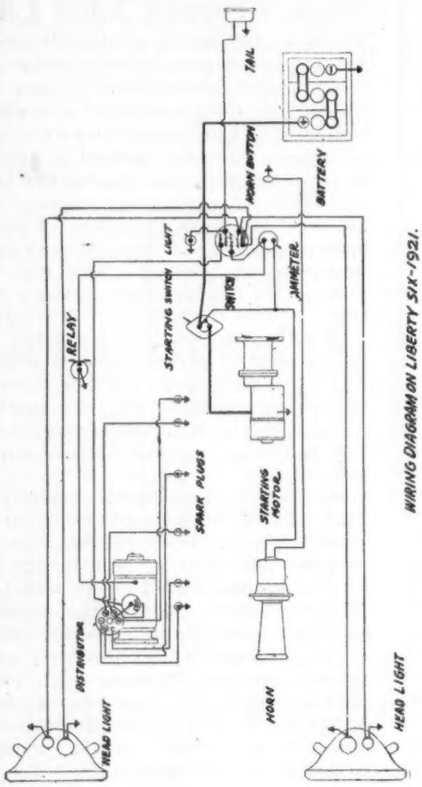
"A Bill; For an act for the better protection of any person, firm or corporation expending labor, skill or materials upon, or furnishing storage for any chattel, creating a lien upon such chattel, and providing for the enforcement of such lien."

The bill as introduced should prove very efficient to garage owners if enacted into law. However, Sec. 4, of the proposed bill fails to remedy and protect the garage owner as he would like to be protected. This section states in statutory form the common law rulings of the state courts, and this part should be stricken out. Without such in the statute it is possible for later decisions to follow the doctrine laid down in other states to the effect that a mortgage holder of an automobile impliedly consents to any repairs made by the mortgagor who retains possession and control of the mortgaged automobile.

In other words he makes the mortgagor his agent to have repairing, etc. done, since the repairs add to the value of the car and enhances his security for that amount. There is wisdom and justice in such a construction of the law, though it is not the law in Illinois as constructed, and the section cited would preclude a reversal of the Illinois rule for a more just rule to repairmen. A section embodying the doctrine suggested should be substituted, for if it should not be able to stand the test in the courts and be declared void, the remainder of the bill would not be affected, under the provision of Sec. 8.

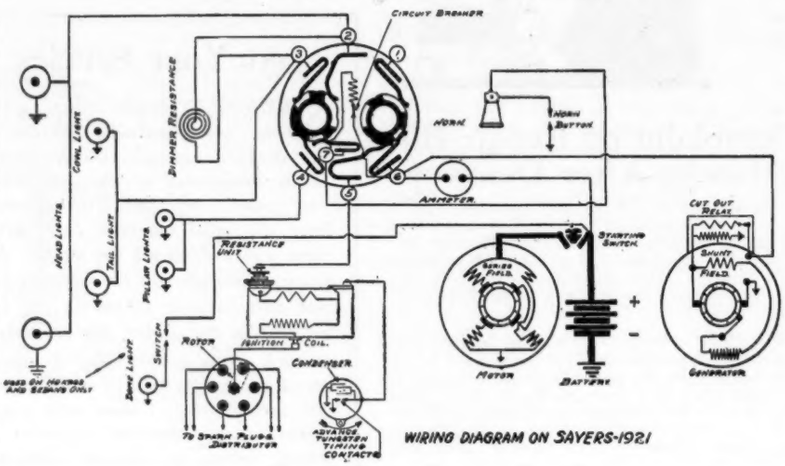
Motor Age Weekly Wiring Chart No. 130

1921 Liberty Six — Wagner System



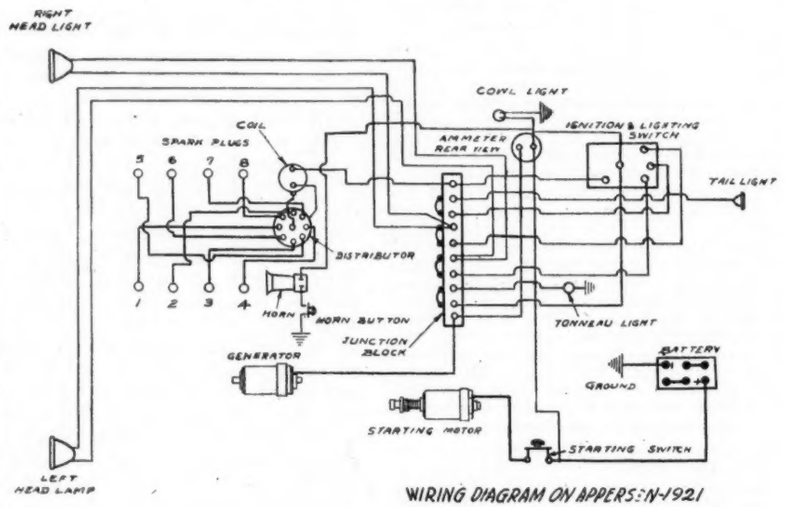
WIRING DIAGRAM ON LIBERTY SIX-1921.

1921 Sayers—Delco System



WIRING DIAGRAM ON SAYERS-1921

1921 Apperson—Bijur System



WIRING DIAGRAM ON APPERSON-1921

Name of Car and Date on Which Wiring Diagrams Have Appeared in Previous Issues

American Beauty—Feb. 17, '21
Case—Feb. 17, '21
Chalmers—Feb. 24, '21
Cleveland—Feb. 24, '21
Cole—Jan. 20, '21; May 5, '21
Daniels—Feb. 17, '21; May 12, '21
Dodge—Sept. 23, '20
Dorris—Feb. 24, '21
Elgin—March 17, '21
Elkhart—March 3, '21
Gardner—April 14, '21; May 19, '21
Grant—March 31, '21
Hudson—Jan. 13, '21; March 17, '21
Hupmobile—Feb. 3, '21; April 14, '21
Jackson—March 17, '21
Jordan—March 10, '21
King—March 3, '21
Kissel—April 28, '21
Klinekar—April 14, '21
Lexington—May 26, '21
Locomobile—May 5, '21
McFarland—March 24, '21
Mercer—March 24, '21; May 12, '21
Mitchell—Jan. 6, '21; April 21, '21
Monitor—March 31, '21
Nash—May 26, '21
National—March 10, '21; May 12, '21
Oakland—March 24, '21
Oldsmobile—April 21, '21; April 28, '21
Packard—March 31, '21
Paige—March 10, '21
Peerless—March 3, '21
Pierce-Arrow—April 21, '21
Premier—Feb. 10, '21
Reo—Feb. 10, '21; May 19, '21
Roamer—Feb. 10, '21
Scripps-Booth—Feb. 3, '21
Sheridan—Feb. 3, '21
Stearns—Jan. 13, '21; May 5, '21; May 19, '21
Stephens—Jan. 13, '21; May 5, '21; May 19, '21
Templar—April 28, '21
Velie—Jan. 20, '21
Winton—May 26, '21

Additional Wiring Diagrams May Be Found in the Readers' Clearing House in This Issue

Passenger Car Serial Numbers

Motor Age Maintenance Data Sheet No. 152

One of a series of weekly pages of information valuable to service men and dealers—save this page

STEPHENS

Year	Model	Cyls.	Price	Serial Numbers
1916	65	6	$1125	101-1100
1917	65	6	1250	
	75	6	1385	10001-13000
1918	80	6	2050	
1919	82 & 84	6	1975	
	83 & 85	6	3050	15001-20000
	86	6	2050	
1920	80	6	2050	

Number plate on dash, right side, under hood

STEARNS-KNIGHT

Year	Model	Cyls.	Price	Serial Numbers
1912	40	4	$3500	5000-5875
1913	28-9	4	3750	6000-6412
	42-8	6	4850	8000-8327
1914	Four	4	3750	6500-6800
	Six	6	4850	8328-8728
1915	L-4	4	1750	L1-L702
	Six	6	5000	9000-9109
1916	Four	4	1395	L703-L2800
	Eight	8	2050	10000-10900
1917	32	4	1450	L2801-L4800
	33	8	2150	10901-12000
1918	4	4	1785	4745-5900
	8	8	2575	12079-12350
1919	L-4	4	2250	L5901-L7102
	8	8	2700	12351-12404
1920	4	4	-------	7103 up

Number on dash name plate

STUDEBAKER

Year	Model	Cyls.	Price	Serial Numbers
1913	SA	4	$885	301501-315611
	AA	4	1290	101501-110614
	E	6	1550	600001-603002
1914	SC	4	1050	403001-420515
	EB	6	1575	605001-612450
1915	SD	4	985	423001-447419
	EC	6	1385	500001-617155
1916	SF	4	885	460001-474180
	ED	6	1050	630001-637260
1917	SF	4	940	474181-500369
				100000-109500
	ED	6	1180	637261-655270
				200000-207500
	SF	4	845	109501-133051
	ED	6	1050	207501-233495
1918	SH	4	895	133101 up
	EG	6	1695	290001 up
	EH	6	1295	233501 up
1919	SH	4	1225	133101-141951
	EG	6	1985	290001-300635
	EH	6	1585	233501-257389
1920	EH	6	1785	257465 up
	EG	6	2550	315701 up

1913 numbers on front seat heel board
1914-15 numbers on front door pocket
1916-17 numbers inside dash
1918-19 numbers under left front fender on frame

STUTZ

Year	Model	Cyls.	Price	Serial Numbers	
1912	A	4	$2000	Series A	
1913	4-B	4	2050	Series B	
	6-B	6	2300		
1914	4-E	4	2150	Series E	(Also 300 Speedsters Series S, built in 1917. Year is indicated by Series letter)
	6-E	6	2400		
1915	HCS	4	1475	Series F	
	4-F	4	2275		
	6-F	6	2525		
1916	4-C	4	2300	Series C	
1917	4-R	4	2550	Series R	
1918	4-S	4	2750	Series S	
1919	Data not available				
1920					

TEMPLAR

Year	Model	Cyls.	Price	Serial Numbers
1918	A-445	4	$2185	1-150
1919	A-445	4	2485	150 up
1920	A-445	4	2685	

Number plate on dash and right front motor support arm

TULSA

Year	Model	Cyls.	Price	Serial Numbers
1917	D	4	$1150	3000-3400
1918	D	4	1200	3000-3400
1919	D	4	1200	3000-3500
1920	E	4	1335	4000 up

Number on dash, right side, under hood

VELIE

Year	Model	Cyls.	Price	Serial Numbers
1912	L-M-N	4	$2200	14001-15999
	W	4	1350	25000-25500
1913	S-T	4	2000	16000-16725
	R	4	1500	30000—(See 5)
1914	5	4	1500	(See R)—31326
	9	4	2000	17301—(See 12)
	10	6	2350	17001-17300
1915	11	4	1500	32101-32500
	12	4	1750	(See 9)—19251
	14	6	2015	19301-19451
	15	6	1595	19500-20690
1916	22	6	1065	35000-39000
1917	27	6	1600	40000-(See 39)
	28	6	1185	50000—(See 38)
1918	38	6	1440	(See 28)—68506
	39	6	1695	(See 27)—40987
1919	38	6	1685	
	39	----	-------	
	48	6	-------	69001 up
1920	34	6	-------	100001 up

Number on name plate left side seat box. Also stamped into top side of frame at extreme right front end; engine number left side crankcase and left hand front motor leg.

WESTCOTT

Year	Model	Cyls.	Price	Serial Numbers
1912	KLM	4	$1800	
	R	4	2250	
1913	4-40	4	1975	
	6-50	6	2475	
1914	30	4	1385	800-1102
	6-60	6	2485	
1915	O-35	4	1185	1103-1348
	U-50	6	1585	1500-1699
1916	41	6	1295	4001-4200
	42	6	1445	4201-5100
	51	6	1595	4599-5402
1917	17	6	1590	5501-6292

Number on dash plate

1918	S-18	6	1890	6293-7200
	18-A	6	2290	7201-8088
1919	A-48	6	2590	8101-8904
	A-38	6	1775	10001-10402
	B-38	6	2390	11001-11801
1920	C-38	6	2390	13001 up
	C-48	6	2890	20001 up

Number plate on right side of engine on all cars after S-18

WHITE (Date not available)

WILLYS-KNIGHT

Year	Model	Cyls.	Price	Serial Numbers
1917	88-6	6	-------	1-2500
1917-18-19	88-4	4	-------	1 up
	88-8	8	-------	1-2723
1920	88-4	4	$1725	

Number plate on right rear frame end; engine number of models 88-6 and 88-4 on plate on left side crankcase

WILLY-SIX

Year	Model	Cyls.	Price	Serial Numbers
1917-18-19	89	6	-------	1-12000

Number plate on right rear frame end

Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ace.....G	Guy..	6-3¼x5	123	32x4	$2975	$2975	....	$3680	$3680
Ace.....H	H-S..	6-3⅝x5	123	32x4	2975	2975	....	3680	3680
Ace.....L	H-S..	6-3¼x5	116	32x4	2260	2260	....	....	....
Allen.....Series 43	Own..	4-3½x5	110	32x4	‡1395	1395	....	....	2395
Ambassador.....R	Cont..	6-3⅛x5¼	136	33x5	....	†4500	‖4500	....	6500
Amco.....1921	H-S..	4-3½x5	114	31x4	....	....	....	....	....
American.....C	H-S.	6-3¼x5	127	32x4	2395	2395	2475	....	3495
Anderson.....Series 40	Cont.	6-3¼x4½	120	33x4	2195	1795	1845	2795	2795
Apperson.....8-21-S	Own..	8-3¼x5	130	34x4½	....	†3500	3500	4500	4500
Apperson...Anniversary	Own..	8-3¼x5	130	34x4½	....	†4250	4250	....	....
Auburn.....6-39	Cont..	6-3¼x4½	120	33x4	1745	1695	†1695	2795	2795
Beggs.....20T	Cont..	6-3¼x4½	120	33x4	1885	1885	....	2785	2885
Bell.....4-32	H-S..	4-3½x5	114	31x4	....	1495	....	....	....
Bell.....6-50	H-S..	6-3¼x5	124	32x4	....	1695	....	....	....
Biddle.....B1	Buda.	4-3⅞x5½	121	32x4	3475	3475	....	....	3975
Birch Super-Four	H-S..	4-3½x5	117	33x4	1345	1345	†1395	2295	2295
Birch Light Four	LeR..	4-3⅝x4½	108	30x3½	1195	1195	....	....	....
Birch Light Six	H-S..	6-3¼x5	117	33x4	1695	1695	....	....	....
Bour-Davis.....21S	Cont..	6-3½x5¼	126 •	33x4½	‡2585	†1745	2585	2495	2495
Brewster.....91	Own..	4-4 x5½	125	32x4½	†7900	9000	....	....	10500
Briscoe.....4-34	Own..	4-3⅝x5	109	31x4	1285	1285	....	1885	1885
Brook.....S-21 A	Own..	2-3½x3⅞	90	28x3	395	....	....	....	....
Buick.....21-41-5-6-7	Own..	6-3⅝x4½	118	33x4§	1795	1795	....	2585	2895
Buick.....21-48-9-50	Own..	6-3⅝x4½	124	34x4½	....	....	2065	2985	3295
Bush.....E C 4	Lyc..	4-3½x5	116	33x4	....	1245	....	....	....
Bush.....E C 6	Rut..	6-3⅛x5	116	33x4	....	1575	....	2050	2150
			125	34x4½	3790	†3790	....	....	4950
Cadillac.....59	Own..	8-3⅛x5⅛	132	35x5	....	....	3940	....	5190
Carroll.....C	Roch..	6-3½x5	128	....	3985	3985	....	....	....
Carroll.....D	Roch..	6-3½x5	128	....	3185	3185	....	....	....
Case.....V	Cont..	6-3½x5¼	126	34x4½	....	†2650	2650	3400	3750
Chalmers.....6-30	Own..	6-3¼x4½	117	32x4	1795	1795	1945	2595	2745
Chalmers.....6-30	Own..	6-3¼x4½	122	33x4½	....	....	1945	....	....
Champion.....Tourist	Lycom	4-3½x5	113	32x3½	....	1250	....	....	....
Champion.....Special	H-S..	4-3½x5	118	32x4	†1595	1595	....	....	....
Chandler.....Six	Own..	6-3½x5	123	33x4	1930	†2010	1930	2930	3030
Chevrolet.....490	Own..	4-3⅛x4	102	30x3½	635	645	....	1155	1195
Chevrolet.....FB	Own..	4-3⅛x5¼	110	33x4	1320	1345	....	2075	2075
Cleveland.....40	Own..	6-3 x4½	112	32x4	1465	1465	....	2375	2475
Climber Four	H-S	4-3½x5	117	....	1550	1550	....	....	....
Climber Six.....S	H-S..	6-3¼x5	125½	32x4½	2750	2750	....	....	....
Cole.....870	Nort..	8-3½x4½	127	33x5	3250	†3250	3250	4250	4450
Columbia.....D-C&CS	Cont..	6-3¼x4½	115	32x4	1945	1795	1995•	2895	2895
Comet.....C-53	Cont..	6-3½x5¼	125	33x4½	....	2350	2450	....	3650
Commonwealth.....44	H-S..	4-3½x5	117	32x4	....	1595	....	....	2465
Crawford.....21-6-40	Cont..	6-3½x5¼	122½	32x4	3000	3000	....	....	4500
Crow-Elkhart....L63-65	Lyc..	4-3½x5	117	32x3½	‡1295	1295	....	....	....
Crow-Elkhart....S63-65	H-S..	6-3¼x5	117	33x4	‡1545	1545	....	....	2395
Cunningham.....V-4	Own..	8-3¾x5	142	35x5	33x5	....	....	....	....
Daniels.....D-19	Own..	8-3½x5¼	132	34x4½	‡5350	†5350	5350	6250	6950
Davis.....61-67	Cont..	6-3¼x4½	120	33x4	†1995	1895	†2150	2795	2795
Dispatch.....	....	4-3⅜x5	120	34x4	1290	1350	1350	1525	1575
Dixie Flyer.....H-S-10	H-S..	4-3½x5	112	32x4	1595	1595	....	2570	2570
Dodge Brothers.....	Own..	4-3⅞x4½	114	32x3½	1235	1285	....	1900	2150
Dorris.....6-80	Own..	6-4 x5	132	33x5	....	†4785	4785	5800	6690
Dort.....17-12	D-Ly.	4-3½x5	108	31x4	1115	1115	....	1685	1835
Dupont.....A	Own..	4-3⅛x5⅛	124	32x4½	3400	†3400	....	....	4900
Elcar.....K-4	Lyc...	4-3½x5	117	33x4	1300	1300	....	....	....
Elcar.....7-R	Cont..	6-3¼x4½	117	33x4	‡1700	1700	....	2500	2600
Elgin.....K-1	Falls.	6-3¼x4¼	118	33x4	†1895	1775	....	2795	2795
Essex.....	Own..	4-3⅜x5	108½	32x4	1595	1595	....	2100	2450
Fergus.....S-5-21	Own..	6-3¼x5	126	33x4½	....	Chassis	Price	10000	....
Ferris.....	Cont..	6-3½x5¼	130	32x4½	3350	....	*3350	....	4100
Ford.....T	Own..	4-3⅜x4	100	30x3½	395	440	....	745	795
Franklin.....9-B	Own..	6-3¼x4	115	32x4	2700	2800	†2750	....	3850
Friend.....Four	Own..	4-3¼x4½	112	32x3½	‡1285	1285	....	1985	2085
Globe.....B-10	Supre.	4-3⅜x5	115	32x4	....	....	....	....	....
Grant.....Six	Own..	6-3½x4½	116	32x4	1550	1550	....	2450	2450
Gardner.....G	Lyc...	4-3½x5	112	32x3½	‡1195	1195	....	....	2145
Halladay.....21	Rut...	6-3½x5	116	33x4	....	2285	....	....	....
Handley-Knight.....	Kn'ht	4-4½x4½	125	32x4½	....	....	2985	....	4185
Hanson Six.....60	Cont..	6-3¼x4½	121	32x4	2185	2185	†2285	....	3165
Hanover Light.....	Own..	2-3½x4	90	28x3	345	....	....	....	....
Harroun.....A-A-2	Own..	4-3¼x5¼	106	30x3½	....	1195	....	....	....
Hatfield.....A-42	H-S..	4-3½x5	115	32x4	1695	1695	....	....	2595
Haynes.....47	Own..	6-3½x5	132	34x4½	3500	†2935	2935	....	4250
Haynes.....50	Own..	6-3½x5	121	33x4	....	1985	....	....	....
Haynes.....48	Own..	12-2⅞x5	132	34x4½	4200	†3635	3635	....	4950
Huffman.....R	Cont..	6-3¼x4½	120	32x4	1795	1795	....	....	2775
H.C.S.....	Weid..	4-3⅝x5½	120	32x4½	2925	†2975	....	3650	....
Holmes.....Series 4	Own..	6-3½x4¼	126	34x4½	†3350	....	3350	4250	4550
Hudson Super 6.....	Own..	6-3½x5	126	34x4½	†2400	....	2400	3275	3400
Hupmobile.....Series R	Own..	4-3¼x5½	112	32x4	1485	1485	....	2400	2485
Jackson.....638	Cont..	6-3¼x4½	121	32x4½	†2685	1950	....	3760	3760
Jordan.....M	Cont..	6-3¼x4½	120	32x4	2250	2250	2475	3300	3300
Jordan.....F	Cont..	6-3½x5¼	127	32x4½	....	....	2875	....	....
Kelsey.....GF	Own..	6-3⅛x4¼	118½	32x4	1800	1800	....	2700	2700
Kenworthy.....8-90	Own..	8-3 x5¼	130	32x4½	5000	5000	5250	6000	6000
Kessler.....K	Own..	4-3⅜x3¾	117	32x4	....	1995	....	....	2445
King.....J	Own..	8-3 x5	120	32x4½	2740	†2725	*2725	....	4035
Kissel.....45	Own..	6-3⅞x5½	124	32x4½	3475	†3475	2775	4275	4275
Kline Kar.....6-55-K	Cont..	6-3¼x4½	121	33x4	2290	2290	2290	3250	3290
Kurtz Automatic.....A	H-S..	6-3¼x5	122	32x4	....	2250	....	....	3000
LaFayette.....134	Own..	8-3½x5¼	132	33x5	5625	5625	5625	7200	7400
Leach.....21-A-B&C	Cont..	6-3½x5¼	128	32x4½	‡5700	5200	5700	....	....
Lexington.....Series S	Cont..	6-3¼x4½	122	32x4	....	2285	....	3250	3350
Lexington.....Series T	Anst..	6-3¼x4½	128	32x4½	....	....	2985	....	4250
Liberty.....10-C	Own..	6-3½x5	117	32x4	1795	1795	†1885	2825	2850
Lincoln.....	Own..	8-3⅜x5	130	33x5	4600	4600	4600	5750	6000
Locomobile.....	Own..	6-4½x5½	142	35x5	....	†8600	8600	....	....
Lone Star.....	Lyc..	4.....	....	....	....	....	....	....	....
Lorraine.....21-T	H-S..	4-3½x5	114	32x4	1665	1665	....	2590	2590

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Maibohm.....B	Falls..	6-3⅛x4¼	116	32x4	‡1575	$1575	†1750	$2395	$2395
Marmon.....34	Own..	6-3⅜x5⅛	136	32x4½	4185	†3985	3985	4875	5275
Maxwell.....25	Own..	4-3⅝x4½	109	30x3½	845	845	....	1445	1545
McFarlan.....1921	Own..	6-4½x6	140	33x5	6300	†6300	6300	7500	7500
Mercer.....Series 5	Own..	4-3¾x6¾	132	32x4½	4500	†4500	*4500	5700	6200
Merit.....	Cont..	6-3¼x4½	119	32x4	2245	†2245	....	....	....
Meteor.....R&RR	Dues.	4-4¼x6	129	32x4½	5500	5500	....	....	....
Metz.....M6	Rut...	6-3⅛x5	120	32x4	1995	1995	....	2795	2895
Mitchell.....F-40	Own..	6-3¼x5	120	33x4	‡1750	1750	†1950	2800	2900
Mitchell.....F-42	Own..	6-3½x5	127	33x4	....	....	†4500	....	....
Moller.....A	Own..	4-2⅝x4	100	27x3½	2000	....	....	....	....
Monitor.....B50-52	Cont..	6-3½x5	121	33x4	....	1850	....	....	....
Monroe.....S-9 & 10	Own..	4-3¼x4½	115	32x3½	1440	1440	....	....	....
Monroe.....S-11 & 12	Own..	4-3¼x4½	115	33x4	....	....	....	2400	2500
Moon.....6-48	Cont..	6-3¼x4½	122	32x4	2285	2185	2685	3185	3185
Murray-Mac Six.....	Own..	6-3½x5¼	128	34x4½	4250	4250	4250	....	....
Nash.....681-7	Own..	6-3¼x5	121	33x4	1695	1695	†1850	2650	2895
Nash.....682	Own..	6-3¼x5	127	34x4½	....	....	1875	....	....
Nash Four.....41-4	Own..	4-3¼x5	112	32x3½	1395	1395	....	1985	2185
National Sextet.....BB	Own..	6-3½x5¼	130	32x4½	3750	†3750	3750	4900	4950
Nelson.....D	Own..	4-3½x4⅜	104	32x4	....	1900	....	....	....
Noma.....1C	Cont..	6-3¼x4½	128	32x4½	3000	3200	....	....	4450
Northway.....	Own..	6-3½x5¼	128	33x5	4200	*4200	6000	5600	5400
Norwalk.....430-KS	Lyc..	4-3½x5	116	32x3½	....	1285	....	....	....
Oakland.....34-C	Own..	6-2½x4¾	115	32x4	1145	1145	....	1815	1815
Ogren.....6-60	Own..	6-3½x5¼	134	33x5	‡3850	3750	3900	5000	5100
Oldsmobile.....43-A	Own..	4-3½x5¼	115	32x4	†1445	1445	....	2145	2145
Oldsmobile.....37A	Own..	6-2½x4¾	112	32x4	†1450	1450	....	2145	2145
Oldsmobile.....46	Own..	8-2⅞x4¾	122	33x4½	....	‡2100	2100	....	3300
Oldsmobile.....47	Own..	8-2⅞x4½	115	32x4	....	†1695	....	2395	2395
Overland.....4	Own..	4-3½x4	100	30x3½	695	695	....	1000	1275
Packard.....Single-Six	Own..	6-3⅜x4½	116	33x4½	2975	2975	....	4150	4250
Packard.....Twin Six	Own..	12-3 x5	136	35x5	6000	*6000	6000	8200	8450
Paige.....6-42	Own..	6-3½x5	119	32x4	1795	1795	....	2600	2720
Paige.....6-66	Cont..	6-3⅝x5	131	33x4½	‡2995	....	2895	3775	3850
Pan.....	A Own..	4-3½x5	108	33x4	....	1500	....	....	....
Pan American..E&F-6-55	H-S..	6-3¼x5	121	33x4	2250	2250	....	....	....
Parenti.....1921	Own..	8-2¾x4¼	125	32x4	....	2000	....	....	3000
Paterson.....650	Cont..	6-3¼x4½	120	33x4	....	1895	1925	2895	2895
Peerless.....56-S-7	Own•	8-3½x5	125	34x4½	....	†2990	2990	3680	3950
Peters.....	Own..	2-3½x3⅜	90	28x3	385	....	....	....	....
Piedmont.....4-30	Lyc..	4-3½x5	116	32x3½	....	1395	....	....	....
Piedmont.....6-40	Cont.	6-3¼x4½	122	32x4	....	1795	....	....	....
Pierce-Arrow.....	Own..	6-4 x5½	138	35x5	8000	†7500	7500	8500	9000
Pilot.....6-50	H-S..	6-3¼x5	126	32x4½	2285	2285	2335	3600	3600
Porter.....40	Own..	4-4⅜x6¾	142	35x5	6750	Chassis	Price	....	....
Premier.....6-D	Own..	6-3⅜x5½	126¾	33x5	4600	†4600	4600	5600	6100
Premocar.....6-40 A	Falls..	6-3½x4¼	117	32x3½	....	1295	....	....	....
Raleigh.....A-6-60	H-S..	6-3¼x5	122	32x4½	‡2750	2750	....	3600	3700
Ranger.....A-20	Own..	4-3⅜x5	116	32x4	....	....	....	....	....
R & V Knight.....R	Own..	4-3⅝x5	116	32x4	....	2150	....	2850	2950
R & V Knight.....J	Own..	6-3½x4½	127	32x4½	3350	†3350	3350	4000	4200
Reo.....T-6	Own..	6-3⅛x5	120	33x4	1850	1850	....	2700	2750
Revere.....C	Dues.	4-3⅜x6	131	32x4½	4850	4650	†4650	....	6500
Roamer.....6-54-E	Cont.	6-3½x5¼	138	32x4½	....	....	....	....	....
Romer.....	Cont.	6-3¼x4½	120	32x4	....	....	....	....	....
Rock Falls.....14000	Cont.	6-3⅜x5	132	35x5	....	....	....	....	....
Rolls-Royce.....	Own..	6-4½x4¾	143½	33x5	U. S.	Chassis	Price	11750	....
Saxon.....125	Own..	4-3⅜x5	112	32x4	....	1675	....	2475	2475
Sayers Six.....DP	Cont.	6-3¼x4½	118	33x4	2495	2195	....	....	3295
Scripps-Booth...B-39-42	Nort.	6-2¾x4¾	115	32x4	‡1275	1295	....	1950	2100
Seneca.....L & O	LeR..	4-3½x4½	108	30x3½	1185	1185	....	....	....
Severin.....Six	Cont.	6-3½x5¼	122	33x4	1485	1485	....	2100	2250
Severin.....Six	Cont.	6-3½x5¼	122	33x5	2550	2550	2550	3250	3350
Sheridan.....4	Nort.	4-3¼x5¼	116	33x4	1685	1685	....	2565	2765
Sheridan.....8	Nort.	8-3½x4½	132	33x5	....	....	....	....	....
Skelton.....35	Lyc..	4-3½x5	112	32x3½	1295	1295	....	....	....
Southern Six.....660-2	H-S..	6-3¼x5	127	32x4½	2875	2875	2995	....	....
Standard.....J	Own..	8-3¼x5	127	34x3½	3400	†3400	3400	4500	4500
Stanley Steamer.....	Own..	2-4 x5	130	34x4½	....	3950	3950	5650	5775
Stanwood Six.....	Cont.	6-3¼x4½	118	33x4	2050	2050	....	2950	2950
Stearns.....SKL4	Own..	4-3⅝x5⅝	125	34x4½	2550	2450	2675	3400	3700
Stephens.....90	Own..	6-3¼x4½	122	33x4½	2400	†2400	2400	3400	3400
Stevens Duryea.....E	Own..	6-4⅛x5½	138	35x5	8500	†8000	8000	9500	9500
Studebaker.....EJ-40	Own..	6-3⅛x4½	112	32x4	©1850	1485	....	....	2150
Studebaker.....EH-50	Own..	6-3½x5	119	32x4	1750	1750	†1750	2650	2750
Studebaker.....EG-60	Own..	6-3⅞x5	126	33x4½	....	....	2150	....	....
Stutz.....	Own..	4-4⅜x6	130	32x4½	3900	†4000	*4000	5500	....
Templar.....A-445	Own..	4-3⅝x5½	118	32x4	2885	2885	†2885	3785	3785
Texan.....A-38	Lyc..	4-3½x5	115	33x4	1195	1195	....	....	....
Texan.....C-12	H-S.	4-3½x5	115	33x4	1350	1350	....	....	....
Tulsa.....E-1-2-3	H-S..	4-3½x5	117½	33x4	1385	1385	....	....	....
Velie.....48	Cont.	6-3¼x4½	115	32x4	1885	1885	†2200	2885	2885
Velie.....34	Falls.	6-3⅜x4¼	112	32x3½	1485	1485	....	....	2485
Vogue.....6-55	H-S.	6-3¼x5	124	32x4	....	2285	2360	3050	3050
Vogue.....6-66	Cont.	6-3½x5¼	124	33x4½	....	2485	2560	3250	3250
Washington.....	Fal's.	6-3⅝x4¼	114	32x4	....	1685	....	....	....
Wasp.....2611	Wisc.	4-4¾x5½	132	33x5	....	†6500	....	....	....
Westcott.....C-48	Cont.	6-3½x5¼	125	32x4½	....	2990	2990	....	4590
Westcott.....C-38	Cont.	6-3¼x4½	118	33x4	2290	2290	....	3390	3390
Wharton.....A	Curt.	8-4 x5	136	34x4½	....	†4885	4885	....	....
Wills-Sainte Claire.....	Own..	8-3¼x4	121	32x4½	3275	3200	....	....	....
Willys-Knight.....20	Own..	4-3⅝x4½	118	33x4	1895	1895	....	2550	2750
Winther.....61	H-S.	6-3¼x5	120	32x4½	....	....	....	....	....
Winton.....25	Own..	6-3⅜x5½	132	35x5	4600	†4975	4600	5950	†5950

•—6-passenger. †—4-passenger. ‡—3-passenger. ©—Special Body.

Engine Make: Cont—Continental. D.Ly—Dort Lycoming. Dues.—Duesenberg. GBS—Golden, Belknap & Swartz. H-S—Herschell-Spillman. Lyc—Lycoming. Nort—Northway. Roch—Rochester. Rut—Rutenber. Tee—Teetor. Wal—Walther. Wisc—Wisconsin. Weid—Weidely. LeR—Leroi. Curt—Curtiss. §—Model 47—34x4½ Tires.

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason, R	1	$2260	3¾x5½	36x3½	36x5	W
Acason, RB	1½	2485	3¾x5½	36x3½	36x6	W
Acason, H	2½	3295	4⅜x5¾	36x4*	36x4d*	W
Acason, L	3½	4295	4⅜x5¾	36x5*	36x5d*	W
Acason, M	5	5250	5 x6¼	36x6	40x12	W
Ace, C	1½	2750	3¾x5⅛	34x3½*	34x5*	W
Ace, A	2½	3450	4¼x5½	36x4*	36x7	W
Ace	3	3650	4¼x5½	36x6	36x8	W
Acme, G	¾	....	3¾x5	35x5†	35x5†	W
Acme, B	1	....	3¾x5	34x3½	34x5	W
Acme, F	1½	....	3¾x5	34x3½	34x5	W
Acme, A	2	....	4½x5¼	36x4	36x7	W
Acme, C	3½	....	4½x5½	36x5	40x10	W
Acme, E	5	....	4⅜x6	36x6	40x12	W
Akr'nMulti-Trk20	1	1995	4 x5¼	34x5	34x5	B
All-Power, C	3½	5800	4½x6	36x7	36x10	W
All-American, B-1	1	1795	3½x5	32x4	32x4	I
All-American C-1	1½	2195	3½x5	34x4	34x5	I
American, 25	2½	3575	4 x6	36x4*	36x4d*	W
American, 40	4	4575	4½x6	36x5*	36x5d*	W
Apex, G	1	1675	3½x5	33x5†	33x5†	I
Apex, D	1½	1915	3¾x5⅛	34x3½	34x4	I
Apex, E	2½	2695	4¼x5½	36x4	36x7	I
Apex, F	3½	3975	4½x6	36x5	36x10	I
Armleder, HW	2½	....	4¼x5½	36x4*	36x7*	W
Armleder, KW	3½	....	4½x6	36x5	36x5d	W
Armleder, 20	1	....	3¾x5¼	34x3½*	34x5*	W
Atco, B	1½	....	3¾x5¼	34x5†	36x6*	I
Atco, B1	1½	....	3¾x5¼	34x5†	36x6†	I
Atco, A	2½	....	4¼x5½	36x4†	36x8*	W
Atlas, M.D	1	....	3½x5	32x4½†	32x4½†	W
Atterbury, 20R	1½	2775	3¾x5	34x3½	34x5	W
Atterbury, 7CX	2½	3375	4½x5¼	36x4	36x4d	W
Atterbury, 7D	3½	4175	4½x5½	36x5	40x5d	W
Atterbury, 8E	5	5575	4⅜x6	36x5	40x6d	W
Autocar, 21UF	1½–2	2300	4¾x4½*	34x4*	34x5*	D
Autocar, 21UG	1½–2	2400	4¾x4½*	34x4*	34x5*	D
Autocar, 26Y	....	4350	4¼x5½	34x5	36x10	D
Autocar, 26-B	....	4500	4¼x5½	34x5	36x10	D
Available, H1½	1½	2750	4 x5⅛	36x3½*	36x5*	W
Available, H2½	2½	3475	4 x5⅛	36x4*	36x8*	W
Available, H3½	3½	4475	4½x5½	36x5	40x5d	W
Available, H5	5	5375	4⅜x6	36x6	40x12	W
Available, H7	7	6000	5 x6	36x6	40x14	B
Avery	1	....	3 x4	34x5†	34x5†	I
Beck, A. Jr.	1	1800	3¾x5	34x3½	34x4	I
Beck, C	2	2550	4½x5½	36x4	36x6	I
Bell, O	2½	2750	4½x5½	34x4	34x7	I
Bell, E	1½	2250	3¼x5¼	34x3½	34x5†	I
Belmont, E	2	2195	3¾x5	34x3½*	34x6*	D
Belmont, D	3½	3195	4 x6	36x5*	36x5d*	D
Bessemer, G	1	1700	3½x5	35x5†	35x5†	I
Bessemer, H-2	1½	2445	3¾x5	36x3½	36x5	I
Bessemer, J-2	2½	3285	4½x5¼	36x4	36x4	I
Bessemer, K-2	4	4485	4½x5½	36x6	36x10	I
Bethlehem, K	1	....	3½x5	34x4½†	35x5	I
Bethlehem, G	2	....	4 x5¼	34x3½*	34x6*	I
Bethlehem, H	3	....	4 x5¼	36x4*	36x8	I
Bethlehem, J	4	....	4½x5½	36x5*	36x5d*	I
Bollstrom, 30	1½	2100	3¾x5¼	34x3½	34x6	I
Bollstrom, 50	2½	2800	4¼x5¼	36x4	36x8	I
Bollstrom, 70	3½	3800	4½x6	36x5	36x10	I
Bollstrom, A-20	4	6000	5¾x7	40x8†	40x8†	I
Bollstrom, B21	4	5050	4½x5½	36x7	36x7	I
Bridgeport, A	1½	2350	3¾x5¼	34x3	34x6	W
Bridgeport, B	2½	2850	4¼x5½	36x4*	36x7*	W
Bridgeport, C	4	3650	4½x6	36x5	36x5d	W
Bridgeport, D	6	4500	4½x6	36x6	36x6d	W
Brinton, F	2½	3400	4½x5¼	36x4	36x7	W
Brockway, E	¾	1675	3¾x5	35x5†	35x5†	B
Brockway, S-4	1½	2250	3¾x5	36x3½*	36x5*	W
Brockway, K-S	2½	3200	4½x5½	36x4	36x7	W
Brockway, R-4	3½	4100	4½x5½	36x5	36x5d	W
Brockway, T	5	5250	4⅜x6	36x6	40x6d	W
Case, ††	2	3000	4¼x5¾	36x6	38x7	I
Capitol, G1½	1½	2975	3¾x5	35x5	38x7	W
Capitol, H2½	2½	3700	4¼x6	36x4	36x8	W
Capitol, K2½	2½	4250	4¼x6	36x6	42x9	W
Capitol, M3½	3½	4425	4¼x6	36x5	36x10	W
Champion Light Commercia l	½	1100	3½x5	32x3½	32x3½	I
Chevrolet, G	¾	820	3⅛x4	31x4†	34x4½†	B
Chevrolet, T	1	1225	3⅛x5¼	33x4†	35x5†	W
Chicago, C1½	1½	....	3¾x5½	36x3½*	36x5*	W
Chicago, C2½	2½	....	4 x5½	36x4*	36x7*	W
Chicago, C3½	3½	....	4½x5½	36x5	36x10	W
Chicago, D5	5	....	4½x5½	36x6	40x12	W
Climber, A 20	1½	2450	3½x5	36x6*	38x7*	I
Clydesdale, 18	¾	1890	3¾x5	34x5	34x5	W
Clydesdale, 32C	1	2375	3¾x5½	34x3½*	34x5*	W
Clydesdale, 42C	1½	2750	4 x5½	36x3½	36x5	W
Clydesdale, 65C	2½	3540	4¼x5½	36x4	36x7	W
Clydesdale, 65EC	2½	3775	4½x5½	36x4	36x7	W
Clydesdale, 90C	3½	4400	4½x5½	36x5	40x10	W
Clydesdale, 120C	5	5500	4⅜x6	36x6	40x12	W
Collier, 18	1	....	3¾x5	34x4	34x5	W
Collier, 19	1½	....	3¾x5	36x4	36x6	W
Collier, 21	2	....	4¼x5¼	36x4	36x7	W
Collier, 22	2½	....	4¼x5¼	36x4	36x4	W
Columbia, H	1½	2350	3¾x5	35x5†	34x5	I
Columbia, G	2½	2850	4 x5¼	36x4	36x7	I
Comet	1½	1950	3¾x5	34x4	34x4	W
Commerce, T	¾–1¼	1450	3¾x5	34x4½†	34x4½†	B
Commerce, 12	1½	1800	3¾x5	35x5†	35x5†	I
Commerce, 16	2	2150	3¾x5	35x5†	35x6†	I
Concord, A	1½	2700	4 x5½	36x3½	36x6	W
Concord B	2½	3600	4¼x5½	36x4	36x8	W
Concord AX	1½	2950	4 x5½	36x3½	36x6	W
Concord, BX	2½	3600	4½x5½	36x4	36x8	W
Cook, 41	2	$3000	4 x5½	36x6†	38x7†	I
Corbitt, E	1	2400	3¾x5	34x3½	34x4	W
Corbitt, D	1½	2800	3¾x5	36x3½	36x5	W
Corbitt, C	2	3500	4½x5¼	36x3½	36x7	W
Corbitt, B	2½	3650	4½x5¼	36x4	36x7	W
Corbitt, A	3½	4500	4½x5½	36x5	36x10	W
Corbitt, AA	5	5500	4¾x6	36x6	40x6d	W
Cyclone	1½	2800	3½x5	34x5†	36x6†	I
Dart, S	1½	....	3¾x5½	34x3½	34x6	W
Dart, M	2½	....	4¼x5½	36x4	36x7	W
Dart, W	3½	....	4½x6	36x5	36x10	W
Day-Elder, A	1	2225	3¾x5	34x3½	34x4	W
Day-Elder, B	1½	2425	3¾x5	34x3½	34x5	W
Day-Elder, D	2	2900	4½x5¼	36x4*	36x7	W
Day-Elder, C	2½	3125	4¼x5	36x4	36x7*	W
Day-Elder, F	3½	3950	4½x5½	36x5*	36x5d*	W
Day-Elder, E	5	4875	4½x6	36x5	36x6d	W
Dearborn, F	1½	2180	3¾x5½	34x4*	34x5*	W
Dearborn, 48	2	2500	3¾x5⅛	35x5†	34x7†	W
Defiance G	1	1975	3¾x5	35x5†	35x5†	I
Defiance, D	1½	2550	3¾x5	35x5†	36x6†	I
Defiance, E	2	2750	3¾x5	35x5†	38x7†	I
DeKalb, E2	2½	2250	4¼x5¼	34x3½*	36x5*	W
DeKalb, E2½	2	2600	4¼x5¼	36x4*	36x6*	W
DeMartini 1½	1½	2600	3¾x5	34x3½	34x6	W
DeMartini 2	2	3300	4 x5½	36x3½	36x7	W
DeMartin i3	3	4250	4¼x5½	36x4	36x10	W
DeMartini 4	4	4800	4½x6	36x5	36x12	W
Denby, 12	1	2200	3¾x5	35x5	36x6	I
Denby, 33	1½	2300	3¾x5	35x5†	38x7†	I
Denby, 134	2	2800	3¾x5	36x3½	36x6	I
Denby, 25	3	3600	4½x5¼	36x4	36x7	I
Denby, 27	4	4600	4½x5½	36x5	36x5d	I
Denby, 210	5	5350	4½x5½	36x6	40x6d	I
Dependable, A	¾–1	1650	3½x5	34x5	36x6	W
Dependable, C	1½	2350	3¾x5¼	34x3½	34x5	W
Dependable, D	2	2650	4 x5½	34x5	36x6	W
Dependable, E	2½	2950	4½x5½	36x4	36x7	W
Dependable, G	3½	3350	4½x6	36x6	38x7	W
Diamond T, O	1	2500	3¾x5¼	34x5†	36x6†	W
Diamond T, FS	1½	2960	3¾x5¼	36x3½	36x5	W
Diamond-T, T	1½	2650	3¾x5¼	36x3½	36x5	W
Diamond-T, U	2	3285	4 x5¼	36x4	36x7	W
Diamond-T, K	3½	4675	4¼x5½	36x5	36x5d	W
Diamond-T, EL	5	5400	4½x5½	36x6	40x6d	W
Diamond-T, S	5	5650	4⅜x6	36x6	40x6d	W
Diehl, A	1	....	3½x5	34x4½	35x5	I
Diehl, B	1½	....	3½x5	36x6	36x6	I
Dispatch, F	1	1350	3¾x5	34x4†	34x4†	I
Doane	2½	4100	4¼x5¾	36x5	36x7	C
Doane	3½	5100	4⅜x5¾	36x5	36x5d	C
Doane	6	6000	4¾x6¾	36x6	40x6d	C
Dodge Brothers	½	1085	3⅞x4½	33x4†	33x4†	B
Dorris, K-4	2	3400	4¼x5½	36x4	36x7	W
Dorris, K-7	3½	4400	4¼x5½	36x5	36x10	W
Double Drive B	3	4000	4¼x5½	6	6	W
Douglas G	1½	2050	3¾x5⅛	36x5*	37x8*	W
Douglas I	3	3250	4¼x5½	36x6*	37x8*	W
Duplex, A	1½	2775	4 x5¼	35x5†	38x7†	W
Duplex, E	3½	4250	4¼x5½	36x8	36x8	I
Duty, 21	2	1490	3½x5	34x3½	34x5	I
Eagle, 100-2	2	2275	3¾x5¼	34x4*	34x7*	I
Erie, A	2½	....	4¼x5½	36x4	36x4d	W
Facto, 1921	2½	2895	4¼x5½	36x4*	36x8*	W
Fageol, (Cal.)	1½	3000	3¾x5¼	34x3½*	34x6*	W
Fageol, (Cal.)	2½	3900	4¼x5¾	34x4	36x7	W
Fageol (Ohio) Md	2½	3900	4⅜x5¾	36x4*	36x4*	W
Fageol (Ohio) Hd	3½	5000	4½x6¼	36x5*	40x5d*	W
Fageol, (Cal.)	3½	5000	4½x6¼	36x5	36x5d	W
Fageol, (Cal.)	5	5700	4½x6¼	36x6	40x6d	W
Famous, B10	1	1800	3½x5	36x3½*	36x4*	I
Famous, B12	1½	2100	3¾x5	36x3½*	36x5*	I
Fargo, R	2	2500	3¾x5	36x4	36x6	I
Federal, SD	1	2500	3¾x5	35x5†	36x6†	W
Federal, TE	1½	2725	4½x5¼	36x3½	36x5	W
Federal, UE	2	3025	4½x5¼	36x4	36x7	W
Federal, WE	3½	3950	4½x5½	36x5	36x5d	W
Federal, X 2	5–6	5350	4⅜x5	36x6	40x6d	W
Ford, TT	1	545	3⅞x4	30x3½*	32x4½*	W
Forschler, A	1	....	3½x5	36x3	36x4	W
Forschler, AX	1½	....	3½x5	36x3½	36x5	W
Forschler, B	2	....	4½x5¼	36x4	36x7	W
Forschler, BX	3	....	4½x5¼	36x4	36x8	W
F.W.D., B	3	4200	4⅜x5½	36x6	36x6	B
Front Drive C	1½	2800	3¾x5½	5	4	W
Fulton, A	¾	1750	3½x5	35x5†	35x5†	B
Fulton, C	2	2350	3½x5	34x4	34x6	I
Garford, 15	¾	1590	3⅝x5⅛	34†5†	34x5†	W
Garford, 25	1¼	2090	3¾x5½	36x3½	36x4	W
Garford, 70-H	2	3190	4¼x5½	36x4	36x7	W
Garford, 68D	5	5200	5 x6½	36x6	40x6d	W
Garford, 77D	3½	4390	4½x6	36x5	36x6d	W
Garford, 150-A	7½	5500	5x6½	36x6	40x7d	C
Gary, F	1	2100	3¾x5	36x3½	36x4	W
Gary, I	1½	2550	4 x5½	36x3½	36x5	W
Gary, J	2½	3150	4¼x5½	36x4	36x7	W
Gary, K	3½	4050	4½x6	36x5	40x5d	W
Gary, M	5	5150	5 x6½	36x6	40x6d	W
G.M.C., K15	¾	....	3½x5½	33x4½†	33x4½†	B
G.M.C., K16	1	....	3½x5½	34x5†	34x5†	B
G.M.C., K41	2	....	4x5½	36x4*	36x7*	W
G.M.C., K71	3½	....	4½x6	36x5	40x5d	W
G.M.C., K101	5	....	4½x6	36x5	40x6d	W
Gersix M	1½	$3100	4 x5½	36x3½	36x7	W
Gersix K	2½	3500	4½x5½	36x4	36x8	W
Gersix	3½	4500	4½x6	36x5	40x12	W
Giant, 15–A	1½	2425	3¾x5	34x3½	34x5	W
Giant, 16	2	3250	4½x5¼	36x4	36x7	W
Giant, 17	3½	4150	4½x5½	36x5	36x5d	W
Globe D-20	¾	....	3⅜x5	33x4½†‡	33x4½†‡	..
Golden West, G	3½	4500	4½x5½	36x6	36x6	W
Golden West, H	3½–4	5000	4½x6	36x6	36x6	W
Golden West, GH	3	5000	4½x6	36x7	36x7	W
Golden West, T	4	5500	4¾x6	36x6	36x6	W
Golden West, K	7	6000	5½x6	36x6	36x6	W
Golden West, HA	7	6000	4½x6	36x6	36x10	W
Gove, A1	2½	....	4¼x5¼	36x4*	36x7*	I
Graham Bros. A	1½	2495	3¾x5	35x5†	36x6†	I
Gramm-Bern., 10	1	1495§	3½x5	33x5†	33x5†	B
Gramm-Bern., 15	1½	2050§	3¾x5	36x3½*	36x5*	I
Gramm-Bern., 65	1½	2725§	3¾x5	36x3½*	36x5	W
Gramm-Bern., 20	2	3175§	4½x5¼	36x4*	36x7*	W
Gramm-Bern., 25	2½	3575§	4¼x5½	36x4*	36x4d*	W
Gramm-Bern., 35	3½	4375§	4½x5½	36x5	40x5d*	W
Gramm-Bern., 50	5	5275§	4⅜x6	36x6	40x6d*	W
G.W.W.	1½	2100	3¾x5½	35x5	35x5	I
G & J**	2	3850	4x5¼	36x4	36x7	W
Hahn, J4	1	....	3¾x5	34x5*	34x5*	W
Hahn, CD	1½	....	4¼x5¼	36x3½*	36x6*	W
Hahn, EE	2½	....	4½x5½	36x4*	36x8*	W
Hahn, F	3½	....	4½x5½	36x5*	36x10 *	W
Hahn, EF	5	....	4⅜x6	36x6	40x12	W
Hal Fur, E	1	2350	4 x5	35x5†	35x5†	W
Hal Fur, B	2½	3250	4¼x5½	36x5*	38x7*	W
Hal Fur, F	3½	4250	4½x5½	36x6†	40x10†	W
Hall	1½	3100	3¾x5	34x5†	38x7†	W
Hall	2½	3275	4¼x5¼	36x4	36x6	W
Hall	3½	4100	4½x5½	36x5	36x5d	W
Hall	5	5100	4½x5½	36x5	40x6d	W
Hall	7	5100	4½x5½	36x5	40x6d	C
Harvey, WEA	1½	2550	4½x5½	34x3½	34x5	W
Harvey, WFA	2½	3300	4¼x5½	36x4	36x7	W
Harvey, WHA	3½	4300	4½x6	36x5	36x5d	W
Harvey, WKA	5	5200	4½x6	36x6	40x6d	W
Hawkeye, K	1½	2365	3¾x5¼	34x3½*	34x5*	I
Hawkeye, M	2	2915	4¼x5½	36x4*	36x6*	I
Hawkeye, N	3½	4345	4½x6	36x5*	36x10*	I
Hendrickson, K	5	4800	....	....	....	..
Hendrickson, N	2½	3150	4¼x5¾	36x4*	36x7*	W
Hendrickson, M	3½	3975	4¼x5¾	36x5*	36x5d*	W
Highway,Knight A	4	....	4 x6	36x5	36x6d	W
Highway,Knight B	5	....	4 x6	36x5	40x6d	W
Higrade, A17	¾	1850	3½x5	32x4½	32x4½	W
Higrade, A18	1	2100	3½x5	35x5†	35x5†	W
Higrade, B20	1½	2500	4¼x5¼	35x4†	36x6†	W
Huffman, B	1½	1995	3¾x5	34x3½	34x6	W
Huffman, C	1½	1795	3¾x5½	34x3½	34x6	I
Hurlburt	1½	....	4 x5½	34x4	34x5	W
Hurlburt	2½	....	4¼x5½	36x4	36x4d	W
Hurlburt	3½	....	4½x6	36x5	36x5d	W
Hurlburt	5	....	4½x6	36x5	40x6d	W
Huron Erie	1½	2425	3¾x5¼	36x3½	36x5	I
Huron Mich.	2½	2950	4¼x5½	36x4	36x7	I
Indep'd't(Iowa),G	1½	2040	3¾x5¼	34x3½	34x5	I
Indep'd't(Ia.),H.I.	2½	2940	4⅜x5¼	34x4	34x6	I
Indep'd't(Iowa), B	1	1665	3½x5	34x3½	34x4	W
Indep't'd(Ohio), F	1½	2585	3¾x5	36x3½	36x5	W
Indep't'd(Ohio) H	2½	3285	4½x5¼	36x4	36x4d	W
Indep't'd(Ohio) K	3½	4285	4½x5½	36x5	36x5d	W
Indiana, 12	1¼	....	3¾x5¼	34x3½*	34x5*	W
Indiana, 20	2	....	4¼x5½	36x4*	36x7*	W
Indiana, 25	2½	....	4½x5½	36x4*	36x8*	W
Indiana, 35	3½	....	4⅝x5½	36x5*	36x5d*	W
Indiana, 51	5	....	5 x6¼	36x5*	40x6d*	W
Inland, D	2	2950	4 x5	34x5	34x6	I
International, S	¾	1500	3½x5	34x5†	34x5†	I
International, 21	1	1850	3½x5¼	36x3½	36x3½	I
International, 31	1½	2050	3½x5¼	36x3½	36x4	I
International, 41	2	2400	3½x5¼	36x3½	36x5	I
International, 61	3	2800	4¼x5	36x4*	36x6*	I
International, 101	5	4500	4¼x5	36x5	40x10	I
Jackson, 4WD	3½	4550	4½x5½	36x7	36x7	B
Jumbo, 15	1½	2425	3¾x5¼	36x3½	36x5	I
Jumbo, 20	2	2675	3¾x5¼	35x5†	38x7†	I
Jumbo, 25	2½	3090	3¾x5¼	36x4	36x7	I
Jumbo, 30	3	3590	4¼x5½	36x6†	42x9†	I
Jumbo, 35	3½	4080	4½x6	36x5	36x10†	I
Jumbo, 40	4	4730	4 x6	38x7†	44x10	I
J & J, D	2	3250	4 x5	34x4*	34x6	I
Kalamazoo, G-1	1½	2495	3¾x5	34x4	34x5	W
Kalamazoo, G-2	1½–2	3100	3¾x5	36x4*	36x5*	W
Kalamazoo, H	2½	3700	4 x6	36x4	36x8	W
Kalamazoo, K	3½	4300	4¼x6	36x5	36x10	W
Karavan, A	2½	....	4¼x6	36x4	36x8	W
Kearns, H	¾	1600	3¼x4½	32x4½†	32x4½†	I
Kearns, N	1½	2200	3½x5	34x3½	34x6	I
Kelly-Springfield K-31	1½	2900	3¾x5¼	36x3½	36x6	C
Kelly-S., K-34	1½	2900	3¾x5¼	36x3½	36x6	W
Kelly-S., K-36	2½	3250	3¾x5¼	36x4	36x4d	W
Kelly-S., K-35	2½	3250	3¾x5¼	36x4	36x4d	C
Kelly-S., K-40	3½	4200	4½x6½	36x5	40x5d	C
Kelly-S., K-41	3½	4200	4½x6½	36x5	40x5d	I
Kelly-S., K-42	3½	4200	4½x6½	36x5	40x5d	W
Kelly-S., K-45	4	4550	4½x6½	36x5	40x6d	C
Kelly-S., K-50	5	4900	4½x6½	36x6	40x6d	C
Kelly-S, K-60	6	5100	4½x6½	36x6	40x7d	C
Keystone, 40	2	2450	3¾x5½	34x5†	38x7†	I
Kimball, AB	2	3675	4 x6	36x4	36x7	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. All others solid. ††—Price includes body. §—Price includes several items of equipment.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Kimball, AC	2½	3975	4¼x6	36x4	36x8	W
Kimball, AK	3	4500	4½x6	36x4	36x10	W
Kimball, AE	4	5000	4¾x6	36x5	40x10	W
Kimball, AF	5	5975	5 x6	36x6	40x12	W
Kissel, Express	1	1985††	3½x5½	34x5†	34x5†	W
Kissel, Utility	1½	2775	3½x5½	36x3½	36x5	W
Kissel, Freighter	2½	3475	4¼x5½	36x4	36x7	W
Kissel, H. D.	4	4475	4¼x5½	36x5	36x5d	W
Kleiber, AA	1	2600	4½x5¼	34x3½*	34x5*	W
Kleiber, A	1½	3100	4½x5¼	36x3½*	36x6*	W
Kleiber, BB	2	4000	4½x5¼	36x4*	36x7*	W
Kleiber, B	2½	4200	4½x5½	36x5*	36x8	W
Kleiber, C	3½	4900	4½x5½	36x5	36x5d	W
Kleiber, D	5	5600	5 x6½	36x6	40x12	W
Koehler, D	1½	2285	3½x5	34x3½	34x5	W
Koehler, M	2½	3365	4 x5½	36x4	36x7	W
Koehler, MCS	2½	3450	4 x5½	36x4	36x7	W
Koehler, F	3½	....	4½x5½	36x5	36x10	W
Koehler, MT, Trac	5	3450	4 x5½	36x4	36x7	W
K-Z, 1	1	2250	3½x5½	34x3½	34x5	W
K-Z, 1½	1½	2750	3¾x5	36x4	36x6	W
K-Z, 2½	2½	3250	4½x5¼	36x4	36x8	W
K-Z, 3½	3½	4250	4½x5½	36x5	40x10	W
K-Z, 5	5	5200	4½x5½	36x6	40x6d	W
Lange, B	2½	3350	4¼x5¼	36x4*	36x6*	C
Larrabee, U	1½	2400	3¾x5	34x3½	34x5	W
Larrabee, K	2½	3400	4½x5¼	36x4	36x7	W
Larrabee, L	3½	4200	4½x5½	36x5	36x5d	W
Larrabee, W	5	5100	4¾x6	36x6	40x6d	W
L.M.C., 2-20	2½	2540	4½x5¼	36x4	36x4d	1
Lion, L	1	2350	3¾x5½	35x5†	35x5†	W
Lone Star, 9	1½	1545	3½x5	32x3½†	32x4†	1
Luedinghaus, C	1	2100	3½x5	35x5†	35x5†	W
Luedinghaus, W	1½	2700	3¾x5¼	34x3½*	34x5*	W
Luedinghaus,	2-2½	3150	4¼x5⅝	36x4*	36x7*	W
Maccar, L	1½	2925	4¼x5¼	36x4	36x6	W
Maccar, H	2½	3650	4½x5½	36x4	36x4d	W
Maccar, M-2	3½	4500	4½x6	36x5	36x5d	W
Maccar, G	5	5500	4¾x6	36x5	40x6d	W
MacDonald, A	7½	5750	4½x6	40x7	40x14	I
Mack, AB D.R.	1½	3450	4 x5	36x4	36x3½d	D
Mack, AB Chain	1½	3000	4 x5	36x4	36x3½d	C
Mack, AB Chain	2	3300	4 x5	36x4	36x4d	C
Mack, AB D.R.	2	3750	4 x5	36x4	36x4d	D
Mack, AC Chain	3½	4950	5 x6	36x5	40x5d	C
Mack, AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack, AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack, AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac., AB	5	3400	4 x5	36x4	36x4d	C
Mack Trac., AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac., AC	10	5500	5 x6	36x6	40x6d	C
Mack Trac., AC	13	5750	5 x6	36x6	40x12	C
Mack Trac., AC	15	6000	5 x6	36x7	40x7d	C
Mapleleaf, AA**	2	4150	4 x5¼	36x4	36x7	W
Mapleleaf, BB**	3	4775	4¼x5½	36x4	36x4d	W
Mapleleaf, CC**	4	5770	4½x5½	36x5	36x5d	W
Mapleleaf, DD**	5	6825	4½x5½	36x6	40x6d	W
Master, JW	1½	2690	4⅛x5½	34x3½	34x5	W
Master, W	2½	3290	4¼x5½	34x4	36x7	W
Master, D	2½	3540	4¼x5½	34x4	36x7	D
Master, A	3½	4190	4½x6	36x5	40x5d	W
Master, E	3½	4610	4¼x6	35x5	40x5d	D
Master, B	5	5290	4¾x6½	36x6	40x6d	W
Master, F	5	5440	4¾x6½	35x5	40x6d	D
Master Trac., T	6	3740	4¼x5½	36x7	36x4d	D
Maxwell, 1½	1½	1332	3⅝x4¼	32x3	32x4	W
Menominee, HT	1	2080	3¾x5	34x3½	36x5	W
Menominee, H	1½	2725	4 x5	36x3½	36x5	W
Menominee, D	2	3245	4 x6	36x4	36x8	W
Menominee, G	3½	4270	4½x6	36x5	36x10	W
Menominee, J3	5	5450	4¾x6	36x6	40x12	W
Moline, 10	1½	2450	3½x5	34x5†	36x6†	I
Moreland, 20N	1	2850	3¾x5	35x5†	36x6†	I
Moreland, 21B	1½	3125	4½x5¼	36x3½	36x6	W
Moreland, 21C	2½	3900	4½x5½	36x4	36x8	W
Moreland, 21H	3½	4975	4¾x6	36x5	40x5d	W
Moreland, 21J	5	5350	4¾x6	36x6	40x6d	W
Mutual, 2B	2	3450	4 x6	36x4	36x8	W
Mutual, 2BP	2½	4150	4 x6	38x7†	42x9†	I
Napoleon, 7	¾-1	1350	3½x5	38x4	33x4†	I
Napoleon, XX-7	1	1535	3½x5	35x5*	35x5*	I
Napoleon, 11	1½	1860	3½x5	35x5*	36x6*	I
Nash, 2018	1	1895	3¾x5¼	34x3	34x4	I
Nash, 3018	2	2550	3¾x5¼	34x4	34x6	I
Nash, Quad.	2	3250	4¼x5½	36x5	36x5	I
*Nelson, F1½	1½	....	4½x5¼	36x3½	36x5	W
*Nelson, F2	2	....	4½x5¼	36x4	36x7	W
*Nelson, F3½	3½	....	4½x5½	36x5	36x5d	W
*Nelson FC5	5	....	4¾x6	36x6	40x6d	W
Netco, D	2	3100	4½x5¼	36x4*	36x7*	W
Netco, H	2½	3500	4½x5½	36x4*	36x8*	W
New York, M	1½	....	4½x5¼	36x3½	36x5	W
New York, N	2-2½	....	4½x5¼	36x4	36x4d	W
Niles, E	2	3000	4½x5¼	36x4*	36x7*	W
Noble, B30	1½	2585	3¾x5¼	36x3½	36x5	W
Noble, C40	2	2825	4 x5½	36x4	36x7	W
Noble, D50	2½	3150	4¼x5½	36x4	36x8	W
Noble, E70	3½	4010	4½x6	36x5	36x10	W
Northway, B-2	2	3400	4 x6	36x4	36x4d	W
Northway, B-3	3½	4400	4 x6	36x5	40x5d	W
Northwestern W	2	3300	4¼x5¼	34x4	36x6	W
Northwestern WS	2½	3500	4½x5½	36x4	36x8	W
Norwalk, 25E	1	1695	3½x5	34x3½	34x4	W
Norwalk, 35E	1½	2025	3½x5	34x3½	34x3½d	W
Norwalk 35E Spec	1½	2285	3¾x5¼	34x3½	34x5	W
Ogden, A1	1½	2550	3¾x5	36x3½	36x5	W
Ogden, E	2½	3250	4½x5¼	36x4	36x7	W
O. K., K1	1½	2675	4 x5½	36x3½†	36x5†	W

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
O. K., L1	2½	3450	4¼x5½	36x4	36x8	W
O. K., M1	3½	4250	4½x6	36x5	36x5d	W
Old Hickory, W	1	2175	3¾x5	36x3½*	36x4*	W
Old Reliable, A	1½	2350	4 x5	34x4	36x6	W
Old Reliable, B	2½	3500	4¼x6	34x4	36x4d	W
Old Reliable, C	3½	4250	4¼x6	36x5	36x5d	W
Old Reliable, D	5	5250	4¾x6	36x6	40x6d	W
Old Reliable, KLM	7	6000	4¾x6¼	36x6	40x7d	C
Oldsmobile Econ.	1	1500	3½x5¼	35x5†	35x5†	I
Olympic, A	2½	3500	4¼x5½	36x4	36x7	W
Oneida, A-9	1¼	2350	3¾x5½	36x3½	36x5	W
Oneida, B-9	1¾	2915	4 x5¼	36x4	36x7	W
Oneida, C-9	2½	3390	4 x5¼	36x4	36x7	W
Oneida, D-9	3½	4345	4½x5½	36x5	36x10	W
Oneida, E-9	5	5460	4½x5½	36x6	40x12	W
Orleans, A	1½	2750	3¾x5½	36x3½	36x5	W
Orleans, B	2½	3250	4x5½	36x4*	36x7*	W
Orleans, C	3½	3750	4½x5½	36x4½	36x8	W
Orleans, D	5	4250	4½x5½	36x6	40x8	W
Oshkosh, A	2	3750	3½x5	36x6†	36x6†	4
Oshkosh, AA	2	3850	3½x5	36x6†	36x6†	4
Oshkosh, B	2½	4150	4 x5½	38x7†	38x7†	4
Oshkosh, BB	2½	4300	4 x5½	38x7†	38x7†	4
Packard, EC	....	3700	4⅞x5½	36x4	36x7	W
Packard, ED	....	4450	4½x5½	36x5	36x5d	W
Packard, EF	....	5550	5 x5½	36x6†	40x6d†	W
Packard, EX	....	4200	4⅞x5½	36x6†	40x8†	W
Paige, 52-19	1½	2880	4 x5¼	34x3½	34x6	W
Paige, 54-20	2½	3400	4¼x5½	34x4	34x4d	W
Paige, 51-18	3½	4285	4½x5½	36x5	36x5d	W
Parker, FZ0	2	3500	4 x6	34x4	36x4d	W
Parker, JZ0	3½	4400	4½x6	36x5	40x5d	W
Parker, M20	5	5500	4¾x6	36x6	40x6d	W
Patriot, Revere	¾	1785	3¾x5	35x5†	35x5†	W
Patriot, Lincoln	1½	2450	4 x5¼	34x3½*	34x5*	W
Patriot, Washg't'n	2½	3450	4½x5½	36x4*	36x7*	W
Piedmont, 4-30	1½	1685	3½x5	34x4†	34x4†	W
Pierce-Arrow,	2	3750	4 x5½	36x4	36x4d	W
Pierce-Arrow	3½	4950	4½x6¾	36x5	36x5d	W
Pierce-Arrow	5	5700	4½x6¾	36x5	40x6d	W
Pioneer, 59	1	1650	3¾x4¼	32x4½†	32x4½†	W
Pittsburger, B 21	2½-3	3800	4½x5¼	36x5*	36x7*	C
Pony	¼	400	2¾x4	28x3†	28x3†	C
Power, F	1½	....	3¾x5¼	36x6	36x6	W
Power, C	3½	....	4¼x5½	36x5	40x10	W
Premocar, B-143	1½	2475	3½x5	36x6†	36x6†	W
Rainier, R-11	¾	2150	3½x5	35x5†	35x5†	W
Rainier, R-15	3½	4503	4½x5½	36x5	36x5d	W
Rainier, R-19	1	2350	3½x5	34x3½	31x4	W
Rainier, R-16	1½	2600	3¾x3	34x3½	34x5	W
Rainier, R-18	2	2950	4½x5¼	34x4	34x6	W
Rainier, R20	2½	3600	4½x5¼	34x4	34x7	W
Rainier, R17	5	5250	4½x6	36x6	36x6d	W
Ranger, TK-20-2	2	....	3¾x5	36x6†	36x6†	W
Reo, F	¾-1½	1385	4½x4½	34x4½†	34x4½†	B
Reliance, 10A	1½	2500	4 x5½	36x3½	36x5	I
Reliance, 29B	2½	3200	4½x5½	36x4	36x4d	I
Republic, 10	1	1695	3¾x5	35x5†	35x5†	I
Republic, 10Exp.††	1	2095	.....	35x5†	35x5†	I
Republic, 11X	1½	2295	3¾x5	34x3½	34x5	I
Republic, 19	2½	2795	4½x5¼	36x4	36x7	I
Republic, 20	3½	3845	4½x5½x	36x5	36x10	I
Riker, B	3	4600	4¼x6	36x5	36x5d	W
Riker, BB	4	4800	4¼x6	36x5	36x6d	W
Rowe, CW	1½	3000	3¾x5	36x6†	36x6†	W
Rowe, HW	4	4500	4¼x6	36x5	36c6d	W
Rowe, C. D. W.	2	3300	4 x5	34x4	36x3½d	W
Rowe, G. S. W.	3	4150	4 x6	34x5	36x5d	W
Rowe, G. P. W.	3	5250	3¼x5‡	38x7†	42x9†	W
Rowe, F. W.	5	5500	4½x6	36x6	40x6d	W
Rumely, A	1½	2720	3¾x5¼	36x3½	36x5	W
Samson, KO 15	¾	865	.....	32x4	32x4	B
Samson, E 25	1¼	1395	.....	35x5	35x5	B
Sandow, G	1	2295	3¾x5	34x3½	34x5	W
Sandow, CG	1½	2500	3¾x5	34x4	34x6	W
Sandow, J	2½	3275	4½x5¼	36x4	36x7	W
Sandow, M	3½	4295	4½x5½	36x5	36x5d	W
Sandow, L	5	4975	4½x5½	36x6	40x6d	W
Sanford, 25	2½	3350	4½x5¼	36x4	36x4d	W
Sanford, 35	3½	4200	4½x5½	36x5	36x5d	W
Sanford, 50	5	5100	4¾x6	36x5	40x6d	W
Schacht, 2-Ton	2	3550	4¼x5½	36x4	36x7	W
Schacht, 2½-Ton	2½	3850	4¼x5½	36x4	36x4d	W
Schacht, 3½-Ton	3½	4350	4¼x6	36x5	36x5d	W
Schacht, 5-Ton	5	5350	4½x6	36x5	40x6d	W
Schwartz, A	1	1685	3½x5	33x4½†	33x4½†	B
Schwartz, BW	1½	2600	3¾x5¼	34x3½*	34x7*	W
Schwartz, C.W.S.	2½	3200	4¼x5½	36x4	36x8	W
Schwartz, DW	5	4900	4½x6	36x6	40x12	W
Selden, 1½A	1½	2360	3¾x5	34x3½	34x5	W
Selden, 2½A	2½	3425	4¼x5¼	36x4	36x7	W
Selden, 3½A	3½	4175	4½x5½	36x5	36x10	W
Selden, 5A	5	5600	4¾x6	36x6	40x12	W
Seneca, M20	½	....	3¼x4½	30x3½†	30x3½†	B
Service, 220	1	2415	3½x5⅝	34x3½	34x5	W
Service, 15	¾-1	1840	4⅜x5	34x4½	34x5	B
Service, 31	1½	2985	4 x5½	36x3½	36x6	W
Service, 36	1½	3415	4¼x5½	35x5†	38x7†	W
Service, 51	2½	3475	4¼x5½	36x4	36x7	W

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Service, 71	3½	4285	4¼x5½	36x5	36x5d	W
Service, 76	3½	4485	4½x6	36x5	36x5d	W
Service, 16	5	5275	4½x6	36x6	40x6d	W
Signal, NF	1	2475	4¾x5	34x5†	36x6†	W
Signal, H	1½	2925	4½x5¼	34x4	36x6	W
Signal, J	2½	3275	4½x5¼	34x4	36x8	W
Signal, M	3½	4275	4½x5½	36x5	40x5d	W
Signal, R	5	5300	4¾x6	36x6	40x6d	W
Southern, 10	1	2290	3¾x5	34x3½	34x4	W
Southern, 15	1½	2590	3¾x5½	36x6†	34x4	W
Southern, 20	2	2990	4¼x5¼	36x6†	40x8*	W
Standard, 1-K	1-1½	1950	3¾x5	34x3½*	34x5*	W
Standard, 76	2½-3	3100	4½x5¼	36x4*	36x7*	W
Standard, 66	3½-4	4000	4½x5½	36x5	36x10	W
Standard, 5-K	5-6	5250	4¾x6	36x6	40x12	W
Sterling, 1½	1½	3200	4 x5¾	36x3½	36x5*	W
Sterling, 2	2	3500	4 x5¾	36x4	36x6	W
Sterling, 2½	2½	3650	4¾x5¾	36x4*	36x4d*	W
Sterling, 3½	3½	4650	4½x6¼	36x5*	40x5d*	W
Sterling, 5-W	5	5500	5 x6¼	36x6†	40x6d*	W
Sterling, 5-C	5	6000	5 x6¼	36x6	40x6d	C
Sterling, 7½	7½	6500	5 x6¼	36x6	40x7d	C
Stewart, 11	¾	1350	3½x4½	32x4†	32x4†	I
Stewart, 12	1	1750	3½x5	35x5†	35x5†	I
Stewart, 9	1½	2200	3¾x5	34x3½	34x5	I
Stewart, 7	2	2800	4¼x5¼	34x4	34x7	I
Stewart, 7-X	2½	2950	4¼x5½	34x4	34x7	I
Stewart, 10	3½	3850	4½x5½	36x5	36x5d	I
Stewart, 10-X	3½	3850	4½x6	36x5	36x5d	I
Stoughton, A	1	1995	3¾x5¼	34x4½†	35x5†	W
Stoughton, B	1½	2350	3¾x5¼	36x3½	36x5	W
Stoughton, D	2	2800	4 x5½	36x4	36x7	W
Stoughton F	3	3600	4¼x5½	36x5d	36x5d	W
Sullivan, E	2	3350	4¼x5½	36x4*	36x7*	W
Sullivan, H	3½	4650	4½x6	36x5	36x5d	W
Superior, D	1	1800	3¾x5	34x4½†	34x4	I
Superior, E	2	2750	4½x5¼	36x4	36x6	I
Super Truck, 50	2½	3300	4 x6	36x4	36x8	W
Super Truck, 70	3½	4300	4¼x6	36x5	40x5d	W
Super Truck, 100	5	5300	4¾x6	36x5	40x12	W
Super Truck 150	7½	6300	5 x6	36x6	40x7d	W
Texan, A38	¾	1095	3½x5	33x4	33x4	I
Texan, TK39	1½	1550	3½x5	36x6	38x7	W
Tiffin, GW	1½	2695	4½x5½	36x3½	36x5	W
Tiffin, MW	2½	3580	4½x5¼	36x4	36x3½d	W
Tiffin, PW	3½	4760	4½x5½	36x5	40x5d	W
Tiffin, F50	5	5850	4¾x6	36x6	40x6d	W
Tiffin, F60	6	6050	4¾x6	36x6	40x12	W
Titan, HT	3½	4550	4½x6	34x4*	40x5d	I
Titan, HD	6	5400	4½x6	36x5	40x6d	I
Titan, TS	2½	3400	4¼x5½	34x4*	36x4d	I
Tower, J	1½	3000	4½x5¼	35x5	38x7	W
Tower, H	2½	3475	4½x5¼	36x4	36x7	W
Tower, G	3½	4400	4½x5½	36x5	36x5d	W
Traffic, C	2	1595	3¾x5	34x3½*	34x5*	I
Transport, 20	1	1850	3¾x5⅛	34x3½	34x4	I
Transport, 30	1½	2250	3¾x5	36x3½	36x5	I
Transport, 50	2½	2785	4¼x5½	36x4	36x7	I
Transport, 70	3½	4195	4½x6	36x5	36x10	I
Traylor, B	1½	2500	3¾x5½	34x3½	34x5	W
Traylor, C	2	3000	4 x5½	36x4	36x7	W
Traylor, D	3	3500	4¼x5½	36x4	36x8*	W
Traylor, E	4	4700	4½x6	35x5	40x10	W
Traylor, F	5	5100	4½x6	36x6	40x6d	W
Triangle, AA	¾-1	1600	3¼x5	35x5†	35x5†	I
Triangle, A	1½	2350	3¾x5¼	34x3½*	34x6*	I
Triangle, C	2	2700	3¾x5¼	36x4*	36x6*	I
Triangle, B	2½	2950	4 x5¾	36x4*	36x7*	I
Triumph, HB	2	2900	3¾x5¼	36x4	36x7	W
Triumph, HC	1½	2550	3¾x5¼	36x3½	36x5	W
Tumbling, J	1	1995	3½x5½	34x5†	34x5†	W
Twin City, B.W.	2	3000	4 x5½	36x4	36x7	I
Twin City, A. W.	3½	4400	4¼x6	36x5	40x5d	W
Twin City, FWDB	3½	4750	5½x6	36x6	36x6	I
Twin City, FWDA	5	5250	5½x6	36x7	36x7	I
Ultimate, A	2	3200	4 x5½	36x3½*	36x6*	W
Ultimate, AJ	2	3250	4¼x5½	35x5†	38x7†	W
Ultimate, B	3	3750	4¼x5½	36x4*	36x4d*	W
Ultimate, BL	3	3850	4¼x5½	36x4*	36x4d*	W
Union, F W	2½	3490	4 x6	36x5*	36x8*	D
Union, H W	4	4485	4½x6	36x6	40x12	D
Union, J W	6	5800	5 x6	36x6	40x14	D
United, A	1½	2445	3¾x5¼	36x3½*	34x5*	I
United, B	2½	3150	4¼x5½	36x4*	36x7*	I
United, C	3½	3975	4¼x5½	36x5	36x5d	I
United, V	5	5100	4½x6	36x6	40x6d	I
U. S., N	1½	2475	3¾x5	36x3½*	36x5*	I
U. S., R	3	3795	4 x5¼	36x4	36x4d	W
U. S., S	4	4595	4½x5½	36x5	36x5d	W
U. S., T	6	5850	4¾x6½	36x6	40x6d	W
Velie, 46	1½	2200	3¾x5	36x3½	36x5	I
Veteran, E**	1-1½	3500	3¾x5¼	35x5†	36x6†	W
Veteran, A**	2-2½	4000	4¼x5½	36x4*	36x7*	W
Veteran, D**	2½-3	4400	4¼x5½	36x4*	36x7*	W
Veteran, H**	3½-4	5600	4½x6	36x5	36x5d	W
Victor, A	1½	2050	3¾x5	34x4	34x5	W
Vim, 29	½	1355	3½x4½	31x4†	31x4†	W
Vim, 31	1	2475	3¾x5½	35x5†	35x5†	W
Vim, 22	2	3150	3¾x5½	36x4	36x6	W
Vim, 23	3	3950	4¼x5½	36x5	36x5d	W
Vulcan, 25	2½	4000	4¼x6	36x4	36x8	W
Vulcan, 25P	3	4800	4¼x6	36x6	40x8	W
Walker-Johnson, B	2½	3500	4¼x5½	36x4	36x8	D
Walter, S	5	5600	4½x6¼	36x6	40x6d	W
Waltham, E	1½	2350	3¾x5¼	36x6†	38x7†	W
Ward-LaF., 2B	2½	3590	4¾x5¾	36x4	36x7	W
Ward-LaF., 4A	3½	4690	4½x6¼	36x5	36x5d	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. All others solid. ††—Price includes body. §—Price includes several items of equipment.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Ward-LaF., 5A	5	5590	5 x6¼	36x6	36x6d	W
Watson, E	1	1865	3¾x5¼	34x4½†	34x4½†	W
Watson, N	3½	4250	4½x5½	36x5	36x10	W
Western, W1½	1½	2550	4⅛x5¼	36x3½*	36x5*	W
Western, L1½	1½	2550	3¾x5	36x3½*	36x5*	W
Western, W2½	2½	3250	4⅛x5¼	36x4	36x7	W
Western, L2½	2½	3250	4¼x6	36x4	36x7	W
Western, W3½	3½	4250	4½x6	36x5	40x5d	W
White, 15	¾	2600	3¾x5⅛	34x5†	34x5†	B
White, 20	2	3450	3¾x5⅛	36x4*	36x7	D
White, 40	3½	4500	3¾x5¾	36x5	40x5d	D
White, 45	5	5000	4¼x5¾	36x6	40x6d	D
White, Hick., E	1	2450	3¾x5	34x5†	34x5†	W
White, Hick., H	1½	2750	3¾x5	36x3½	36x5	W
White Hick., K	2½	3350	4½x5¼	36x4	36x5	W
Wichita, K	1	2300	3¾x5¼	36x3*	36x4*	W
Wichita, L	1½	2600	3¾x5¼	36x3½*	36x5*	W
Wichita, M	2	2800	3¾x5¼	36x3½*	36x6*	W
Wichita, R	2½	3000	3¾x5¼	36x4*	36x7*	W
Wichita, RX	2½	3600	4¼x6	36x4*	36x8*	W
Wichita, O	3½	4000	4¼x6	36x5*	36x5d*	W
Wichita, S	5	5000	4½x6	36x6	40x6d	W
Wilcox, AA	1	2100	3¾x5½	36x4*	36x4*	W
Wilcox, B	1½	2775	4¼x5	36x4	36x5	W
Wilcox, D	2½	3300	4¼x5	36x4*	36x3½d*	W
Wilcox, E	3½	4250	4½x6	36x5*	36x5d*	W
Wilcox, F	5	5200	4¾x6½	36x5	40x6d	W
Wilson, F	1½	2650	3¾x5	36x3½	36x5	W
Wilson, EA	2½	3300	4⅛x5¼	36x4	36x7	W
Wilson, G	3½	4300	4½x5½	36x5	36x5d	W
Wilson, H	5	5275	4½x6	36x6	40x6d	W
Winther, 751	¾	1795	3½x5	34x4½†	35x5†	I
Winther, 430	1½	2850	3¾x5	32x4	32x4	I
Winther, 39	1½	2450	3¾x5	34x3½	34x5	I
Winther, 49	2	3250	4 x5	34x4	34x4d	I
Winther, 450	2½	3690	4 x5	34x5	36x6	I
Winther, 70	3½	4200	4 x6	36x5	36x5d	I
Winther, 109	5	5250	4½x6	36x6	40x5d	I
Winther, 140	7	5900	5 x6	36x6	40x7d	I
Witt-Will, N	1½	2750	3¾x5	36x3½*	36x5*	W
Witt-Will, P	2½	3250	4⅛x5¼	36x3½*	36x7*	W
Wolverine, J	1	2240	3½x5	34x3	34x4	I
Wolverine, J	1½	2495	3¾x5	34x3½	34x5	I
Wolverine, J	2	2750	3¾x5	34x4	34x7	I
Wolverine, J	2½	3475	4⅛x5¼	36x5	36x10	I
Wolverine, L	3½	4150	4½x5½	36x5	36x10	I
Yellow Cab M2	¾	2050	3¾x5	32x4	32x4	B
Yellow Cab M4	1¼	2350	3¾x5	34x4½	34x4½	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. All others solid. ††—Price includes body. §—Price includes several items of equipment.

Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
All-In One	12-25	$1975	3	Weid.	4-3¾x5½	GDK	2-3
Allis-Chalm..B	6-12	925	2	LeR.	4-3⅛x4½	Gas.	1
Allis-Chal.G.P	6-12	850	2	LeR.	4-3½x4½	Gas.	1-2
Allis-Chalm...	12-20	1495	2	Mid.W	4-4⅛x5¼	Gas.	2-3
Allis-Chalm...	18-30	2150	4	Own	4-4¾x6½	GorK	3-4
Allis-Chalm...	10-18	875	4	Own	4-4¾x6½	G,K	4
Allwork...2-G	14-28	....	4	Own	4-4¾x6	GorK	3
Allwork...C	14-28	....	4	Own	4-5 x6	GorK	3
AndrewsKin.D	18-36	2500	4	Clim.	4-5 x6½	GorK	4
Appleton	12-20	1500	4	Buda	4-4¼x5½	G,K	2-3
Aro.....1921	3-5	550	4	Own	1-4½x5	Gas.	1
Aultman-T....	15-30	....	4	Clim.	4-5 x6½	G,K	4
Aultman-T....	22-45	....	4	Own	4-5½x8	G,K	6
Aultman-T....	30-60	....	4	Own	4-7 x9	G,K,D	8
Automot. B-3..	12-24	1785	4	Herc'ls	4-4 x5½	Gas.	2-3
Avery.SR.Cul	5-10	....	4	Own	4-3 x4	G,K	..
Avery..Cult-C	....	....	3	Own	6-3 x4	G,K	..
Avery.....B	5-10	....	4	Own	4-3 x4	G,K	2
Avery.....C	....	....	4	Own	6-3 x4	G,K	..
Avery.....	8-16	....	4	Own	2-5½x6	G,K,D	2-3
Avery.....	12-20	....	4	Own	4-4¾x6	G,K,D	2-3
Avery.....	12-25	....	4	Own	2-6½x7	G,K,D	3-4
Avery.....	14-28	....	4	Own	4-4¾x7	G,K,D	3-4
Avery.....	18-36	....	4	Own	4-5½x6	G,K,D	4-5
Avery.....	25-50	....	4	Own	4-6½x7	G,H,D	5-6
Avery.....	45-65	....	4	Own	4-7¾x8	G,K,D	8-10
Bates.....	15-25	....	4	Own	4-4¼x6	Ker.	3
Bates Mule. F	18-25	....	*2	Midw	4-4½x5¼	Gas.	3
Bates Mule .H	15-25	....	*4	Midw	4-4½x5¼	Gas.	3
Bates Mule G	25-35	....	*2	Midw	4 4½x6	Gas.	com.
Bean.....	8-16	....	*1	Own	4-3⅞x4	G,K	2-3
Beeman....G	2-4	340	4	Own	1-3½x4½	Gas.	½
Best.....	30	....	*2	Own	4-4¾x6½	G,K,D	4
Best.....	60	....	*2	Own	4-6½x8½	G,K,D	8-9
Boring...1921	.....	1850	3	Wauk	4-4¾x5¾	GorK	2
Burn-Oil.1921	15-30	1650	4	Own	2-6¾x7	Ker.	3-4
Capital.....	15-30	1000	2	Own	4-4⅞x6	Gas.	33
Case.....	10-18	1090	4	Own	4-3⅞x5	GorK.	2
Case.....	15-27	1680	4	Own	4-4½x6	GorK	3
Case.....	22-40	3100	4	Own	4-5½x6¾	GorK	4-5
Caterpillar T11	25	....	*2	Own	4-4¾x6	Gas.	4
Caterpillar T16	40	....	*2	Own	4-6½x7	Gas.	6
Centaur.....	5-2½	495	2	NWay	2-4½x4½	G or K	1-9
Chase.....	12-25	....	3	Buda	4-4¼x5½	GorK	2-3
Chicago....	40	2500	4	Own	4-4½x6	Gas.	4
Cletrac....W	12-20	1495	*2	Own	4-4 x5½	G,K,D	2-3
Dakota.....4	15-27	1750	3	Dom.	4-4¾x6	Gas.	3
Dart.....B.J.	15-30	....	4	Buda	4-4½x6	Gas.	3-4
Depue.....A	20-30	2500	4	Buda	4-4½x6	Gas.	4
Dill.....D	20	2480	4	Cont.	4-4½x5½	Gas.	3
Dill.....R.W.	20-	2980	4	Midw.	4-4½x6	Gas	3
Do-It-All.....	4-6	595	..	Own	1-4½x5	Gas.	..
Eagle.....F	12-22	1390	4	Own	2-7 x8	GorK	3-4
Eagle.....F	16-30	1850	4	Own	2-8 x8	GorK	4-5
E-B.....AA	12-20	....	4	Own	4-4¾x5	GorK	4
E-B.....Q	12-20	....	4	Own	4-4¾x5	GorK	3
E-B.....	16-32	....	4	Own	4-5¼x7	GorK	4
Evans.....	18-30	2000	4	Buda	4-4½x6	G,K	3
Fageol.....D	9-12	1525	4	Lyc.	4-3½x5	Gas.	2
Farm Horse..	18-30	1885	4	Clim.	4-5 x6½	G,K	3-4
Farquhar.....	15-25	....	4	Buda	4-4½x6	G,K,D	3-4
Farquhar.....	18-35	....	4	Own	4-6 x8	G,K,D	4-5
Farquhar.....	25-50	....	4	Own	4-7 x8	G,K,D	6-7
Fitch.....4	20-35	....	4	Clim.	4-5 x6½	GorK	3-4
Flour City....	20-35	....	4	Own	4-5¼x6	Ker.	4-6
Flour City....	30-50	....	4	Own	4-6¾x7	Ker.	6-8
Flour City....	40-70	....	4	Own	4-7½x9	Ker.	8-1
Fordson.....	.. 20	625	4	Own	4-4x5	G,K	2
Fox.....E	20-40	1300	4	Own	4-5½x7½	G or K	4
Franklin....G	18-30	4000	*2	Clim.	4-5 x6½	G or K	3-3
Franklin....C	18-20	3350	*2	Clim.	4-5x6½	G or K	3-4
Franklin..G 2	18-30	4350	2	Clim.	4-5 x6½	G or K	3-4
Frick.....A	12-20	....	4	Erd.	4-4 x6	G,K	2-3
Frick.....C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
Fulton.....	10-20	1275	3	Wauk	4-4¾x5	Gas.	2
G-O.....G	14-28	1485	4	Wauk.	4-4½x5¾	GorK	3
Grain Belt..A	18-36	2150	4	Wauk	4-4¾x6¾	GorK.	4
Gray.....1920	18-36	....	3	Wauk	4-4¾x6¾	Gas.	4
Grand Hog..	19-31	$2000	4	Erd.	4-4 x6	GorK	3
Gt. Western St	20-30	1950	4	Beav.	4-4¾x6	K.	4
Hart-Parr..20	-20	1195	4	Own	2-5¼x6½	K.D	3
Hart-Parr..30	15-30	1595	4	Own	2-6½x7	K,D	3
Heider.....D	9-16	....	4	Wauk	4-4¼x5¾	G,K	2
Heider.....C	12-20	....	4	Wauk	4-4½x6¾	G,K	3
Heider.....Cult	6-10	....	4	LeR.	4-3½x4½	Gas.	1
Hicks.....	20-30	....	4	....	4-4½x6	KorG	4
Huber Light 4	12-25	1385	4	Wauk	4-4½x5¾	GorK	3
Huber Super 4	15-30	1885	4	Midw.	4-4½x6	Gas.	3
Illinois, Super Drive..... C	18-36	2500	4	Clim.	4-5 x6½	G,K	4
Imperial....E	40-70	5000	4	Own	4-7½x9	G,K,D	10
Indiana.....F	5-10	....	2	LeR.	4-3⅛x4½	Gas.	1-2
International.	8-16	1000	4	Own	4-4¼x5	G,K,D	2
International.	15-30	1950	4	Own	4-5¼x8	G,K,D	4
J-T.....N	20-40	3485	*2	....	4-4¾x6	G,K,D	3-4
Klumb.....F	16-32	....	4	Clim.	4-5 x6½	....	..
LaCrosse...M	6-12	900	4	Own	2-4 x6	G,K	1
LaCrosse....G	12-24	1250	4	Own	2-6 x7	GorK	3
Lauson.....	12-25	1495	4	Midw.	4-4⅛x5¼	Gas.	3
Lauson.....15	15-25	1685	4	Beav.	4-4½x6	GorK	3-4
Lauson.....21	15-30	1985	4	Beav.	4-4¾x6	GorK	3-4
Leader.....B	12-18	1095	4	Own	2-6 x6¼	G,K,D	2-3
Leader.....N	16-32	1985	4	Clim.	4-5 x6½	G,K	3-4
Leader....GU	18-35	2775	*2	Clim.	4-5x6½	G,K	3-4
Leonard....E	20-30	2530	4	Buda	4-4½x6	G,K	3
Liberty.....A	18-32	2475	4	Clim.	4-5 x6½	G,K	4
Linn.....W	60	5600	*	Wauk.	4-5 x6¼	Gas.	6
Little Bear...	4	850	4	Ford	4-3¾x4	Gas.	..
Little Giant..B	16-22	2200	4	Own	4-4½x5½	K.	4
Little Giant..A	26-35	3300	4	Own	4-5½x6	K.	6
Lombard.....	85-150	....	*2	....	6-5½x6¾	Gas.	16
Lombard.....	50	....	*2	....	4-4¾x6½	....	6-10
Motor Macult.	1½	225	2	Own	1-2¾x3½	Gas.	..
Magnet.....B	14-28	1875	4	Wauk	4-4½x6¼	K&G	3
Master Jr.....	5-10	585	..	LeR.	-2¾x4	Gas.	1
MerryGar1921	2	230	2	Evin	1-2⅝x2½	Gas.	..
Minne ..All-P	12-25	1325	4	Own	4-4½x7	GorK	3
Minne. Gen.P.	17-30	.....	4	Own	4-4¾x7	GorK	3-4
Minne. Med.Duty	22-44	.....	4	Own	4-6x7	GorK	5-6
Minne. HeavyDuty	35-70	.....	4	Own	4-7½x9	GorK	8-9
Mohawk.1921	8-16	785	4	Light	4-3¼x4½	KorG,	1-2
Moline Univ D	9-18	1075	2	Own	4-3½x5	Gas.	2-
Moline Orch..	9-18	1075	2	Own	4-3½x5	Gas.	2-3
Monarch B....	30-20	3400	*2	Beav.	4-4¾x6	G or K	4
Motox.....	15-30	2250	4	Buda	4-4½x6	Gas.	3-4
NB.....1	3-6	425	4	Own	2-3¼x4	Gas.	¾
NB.....2	3-6	425	4	Own	2-2¾x4	Gas.	¾
Nichols-Shep. 20-42	20-42	3100	4	Own	8 x10	GorK	3-6
Nichols Shep. 25-50	25-50	3460	4	Own	9 x12	GorK	4-7
Nilson Jr....E	15-25	1775	4	Wauk	4-4¼x5¾	G or K	3
Nilson Senior.	20-40	2675	5	Wauk	4-5 x6¼	G,K	4
Oil Pull.....K	12-20	1485	4	Own	2-6 x8	K,D	3
Oil Pull.....H	16-30	2285	4	Own	2-7 x8½	K,D	4
Oil Pull.....G	20-40	3175	4	Own	2-8 x10	K,D	5-6
Oil Pull.....E	30-60	4590	4	Own	2-10x12	K,D	8-10
Oldsmar GarK	2½-5	395	4	Own	1-5½x5½	Gas.	2⅝
Oliver.....A	15-30	....	*2	Beav.	4-4½x6	GorK	3-4
Once Over Tiller Mark..6	12-25	3000	4	Strns	4-4½x6	Gas.	2
Parrett.....K	15-30	1950	4	Pitt	4-4½x6	G,K	3
Peoria.....L	12-25	1785	4	Clim.	4-5 x6½	G,K	3
Pioneer.....G	18-36	....	4	Own	4-5½x6	G,K,D	4
Pioneer.....C	30-60	....	4	Own	4-7 x8	Gas.	10
Planet Jr.....	5-10	950	2	LeRoi	4-3¼x4½	Gas	1
Plowman....A	15-30	1995	4	Buda	4-4½x6	G,K	3-4
Port Huron..A	12-25	1700	4	Chief	4-4¾x6	G,K	3
Post.....D	12-20	$1800	4	Wauk	4-4¼x5¾	GorK	2
Prairie Dog..L	9-18	650	3	Wauk	4-3¾x5½	Gas.	2
Prairie Dog..D	15-30	1250	4	Wauk	4-4½x6¼	Gas.	3
Ranger Cul. T-20	8-16	....	4	LeR.	4-3½x4½	Gas.	1
Reed.....	15-30	2750	4	Dom	4-4¾x6	K.	3-4
Reed.....A-1	18-36	2400	4	Dom	4-5 x6	Gas.	4
Reliable.....	10-20	985	4	Own	2-6 x7	Ker.	2
Rex.....	12-25	1600	4	Wauk	4-4¼x5¾	GorK	3
Russell.....	12-24	....	4	Own	4-4½x5¾	GorK	2-3
Russell.....	15-30	....	4	Own	4-5 x6½	GorK	3-4
Russell.....	20-35	....	4	Own	4-5½x7	GorK	4-5
Russell.....	30-60	....	4	Own	4-8 x10	GorK	8-10
Samson....M	.....	995	4	Nov.	4-4 x5½	G,K	2
Sandusky....J	10-20	1250	4	Own	4-4¼x5¼	G,K,D	2
Sandusky....E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
Shawnee Com.	6-12	....	2	LeR.	4-3½x4½	Gas.	10
Shawnee Com.	9-18	....	2	Gray	4-3½x5	....	..
Shelby.....C	10-20	....	4	Erd.	4-4 x6	GorK	2-3
Shelby.....D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Short Turn....	20-40	1500	3	....	4-4¾x6	G,K	3
Square T....A	18-35	2075	3	Clim.	4-5 x6½	K,G	3
Steady Pull....	12-24	1485	4	....	4-4 x5	Gas.	3
Stinson....4E	18-36	1835	4	Beav.	4-4¾x6	G,K	4
Stone.....	20-40	....	4	Beav.	.....	G,K	4
Tioga.....3	15-27	2625	4	Wisc.	4-4½x6	Gas.	3-4
Titan.....	10-20	1000	4	Own	2-6½x8	G,K,D	3
Tillermo....A	2-6	385	..	Vur.	1-4 x4	G,K	..
Topp.....B	30-45	3500	4	Wauk	4-4¾x6¾	Gas.	3-4
Toro Cultivator	6-10	....	3	LeR.	4-3½x4½	Gas.	2
Townsend.....	10-20	....	2	Own	4-6½x7	Ker	2-3
Townsend.....	15-30	....	2	Own	4-7 x8	Ker	3-4
Townsend.....	25-50	....	2	Own	4-8½x10	Ker	4-8
Traction Motor	40-50	....	4	....	8-3¼x5	Gas.	4-5
Traylor....TB	6-12	815	4	LeR.	4-3½x4½	Gas.	1
Triumph....H	18-36	2450	2	Erd.	4-4¾x6	Ker.	4
Trundaar....10	25-40	4250	*2	Wauk	4-5 x6¼	G or K	4
Turner....1921	14-25	1295	4	Buda	4-4¼x5½	G,K	3
Twin City.....	12-20	....	4	Own	4-4¼x6	G,K	3
Twin City.....	20-35	....	4	Own	4-5½x6¾	G,K	3
Twin City.....	40-65	....	4	Own	4-7¾x9	G,K	5-8
Uncle Sam C20	12-20	1385	4	Wid	4-4 x5½	G or K	2-3
Uncle Sam B19	20-30	2300	4	Beav.	4-4¾x6	G or K	3-4
Uncle Sam D21	20-30	2075	4	Beav.	4-4¾x6	G or K	3-4
Universal.....	1-4	475	2	Own	1-3½x5	G	1
Utilitor....501	2½-4	380	4	Own	1-3½x4½	G	5-6
Velie..Biltwell	12-24	1750	4	Own	4-4½x5½	G,K,D	..
Victory....1921	9-18	1350	4	Gray.	4-3½x5	Gas.	3
Victory....1921	15-30	1750	4	Wauk	4-4¼x5¾	Gas.	2
Vim.....B	15-30	1650	4	Wauk	4-4¾x5¾	G,K	3
Wallis.....K	15-25	1600	4	Own	4-4¼x5¾	G,K	3
Waterloo....N	12-25	....	4	Own	2-6½x7	G,K	3
Webfoot....40	25-40	4000	..	....	.....	.....	..
Webfoot....53	28-53	5250	*2	Wisc.	4-5¾x7	G,D	..
Wellington..B	12-22	1600	4	Erd.	4-4 x6	Ker.	6
Wellington..F	16-30	2100	4	Chief	4-4¾x6	Ker.	2-3
Western. 1920	16-32	2100	4	Clim.	4-5x6½	Gas.	3-4
Wetmore.....	12-25	1650	4	Wauk	4-4 x5¾	G,K	4
Wharton....E	12-20	1800	3	Buda	4-4¼x5½	Gas.	3
Whitney.....	9-18	1175	4	Own	2-5½x6½	Gas.	2
Wichita.....T	15-30	2500	4	Bear.	4-4½x6	G,K,D	2
Wisconsin...E	16-30	....	4	Clim.	4-5 x6½	Ker.	3-4
Wisconsin...H	22-40	....	4	Clim.	4-5½x7	Ker.	4
Yuba...15-25	15-25	2945	..	Wisc.	4-4¼x6	G,K,D	5
Yuba...25-40	25-40	4892	..	Wisc.	4-5¾x7	G,K,D	..
Zelle.....	12-25	....	4	....	4-4¼x5½	G or K	3

ABBREVIATIONS; G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14-in. plows. LeR—LeRoi. Clim.—Climax. Beav.—Beaver. Dom.—Doman. Cont.—Continental. Nor.—Northway. Wauk.—Waukesha. Wisc.—Wisconsin. T.C.—Twin City. Vur.—Vurac. Evin.—Evinrude. Midw.—Midwest. Weid.—Weideley. Com.—Commercial Tractor. *—Crawler type. All others are wheel type.

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Memphis	Used Car Show	May 23-June 2
Red Bluff, Calif.	Automobile Show	June 9
Reno Nev.	Automobile Show	July 4-9
Indianapolis	Automobile and Accessory Show	Sept. 5-10
Cincinnati	Fall Automobile Show	Oct. 1-8
New York	Automobile Salon	Nov. 27-Dec. 3
Chicago	Automobile Salon	January—1922

TRACTOR DEMONSTRATIONS

Fargo, N. D.		June 28, 29, 30

RACES

Reno	First Annual Nevada Highway Road Race 1000 Miles	June 3-5
Uniontown Speedway	Speedway Events	June 18
Cincinnati	Speedway Race (Possible)	July 4
Tacoma	Speedway Race	July 4
La Mans	French Grand Prix	July 25
Elgin	Road Race (Possible)	August 3
Pikes Peak	Hill Climb	September 5
Uniontown Speedway	Annual Autumn Classic	September 5
Los Angeles	Speedway Race	November 24

FOREIGN SHOWS

Basle, Switzerland	International Automobile Exhibition	May 28, June 8
Reykjavik, Iceland	Agricultural Machinery	June, 1921
Buenos Aires, Argentina	Passenger Cars and Equipment	September
Luxemburg	Luxemburg Agricultural Sample Exhibition	September
Paris, France	Paris Motor Show	Oct. 5-16
London	British Motor Show, Society Motor Mfrs. and Traders	Nov. 4-12

CONVENTIONS

Greenville, S. C.	South Carolina Automotive Trade Association	July 20
Mackinac Island, Mich.	Summer Meeting Automotive Equipment Association	July 4-9
Chicago	Twenty-eighth Annual Convention National Implement & Vehicle Association	Oct. 12-14
Cleveland	National Tire Dealers' Association	November

Business Notes

The Kant-Score Piston Co., Cincinnati, has been chartered with a capital of $250,000 to manufacture pistons and other automobile parts.

The Ronsit Guaranteed Tire Co., Madison, Wis., has filed a voluntary petition in bankruptcy, scheduling its liabilities at $25,301 and claiming assets of $19,390.

The Never-Fail Carburetor Co., Long Island City, has increased its factory space and output and has just completed a successful merchandising campaign.

The Gruber Tire Co., which has been operating for two years, has increased its capital stock from $50,000 to $250,000 and proposes to erect a factory at Monticello, Iowa, within a short time. H. O. Altenberg of Davenport will be superintendent of the plant. The name of the company will be changed to the Monticello Tire Co.

The Hirsig Sales Co., Nashville, has been appointed southern representative for Multibestos brake lining. The personnel of the Rirsig company includes W. G. Hersig, former sales manager of the Faucette-Huston Co., Chattanooga, Dick Niles, previously with the Southern Auto Supply Co., Chattanooga, Harvey Pride, formerly with the Michelin Tire Co., and Hi Stalons.

The Westinghouse Electric & Mfg. Co.'s gross earnings from sales billed for the year ending March 41, 1921, were, as shown by the company's annual report, $150,980,000, which is an increase of $15,000,000 over the gross earnings of the previous year. The manufacturing and selling cost was $138,774,000; and the net income available for dividends was $12,618,000, or 16.8 per cent on the company's capital stock. Dividends at the rate of 8 per cent per annum were paid during the year on both the preferred and common shares of stock.

The Fort Wayne Tire & Rubber Co., stockholders have considered plans for the reorganization of the concern, these calling for the subscription of stock in a new company by old stockholders in any amount desired the new stockholders being required to deposit 30 per cent of the amount of their subscription. The affairs of the company were recently placed in the hands of a receiver.

The Falls Motor Co., Sheboygan Falls, Wis., a large manufacturer of engines for passenger cars, trucks and tractors, is now operating its works at full capacity to fill its orders. Some departments are working overtime and the remainder on full time. In the last few months the company has completed the installation of a new forge shop, heat treating department and a new testing shop, as well as a complete first aid hospital.

Ohio Fisher Body Co., Cleveland, common stock will be exchanged for common stock of the Fisher Body Corp., Detroit, each holder of common in the Ohio company being entitled to receive $3 in cash and one-fifth of a share of common stock of the parent corporation.

The Western Radiator Corp., Chicago, has taken over the interests of the Hooven Radiator Co. and the B. & W. Mfg. Co., both of that city. Manufacturing will continue in the plant at 410-420 North Western avenue, to which the B. & W. equipment is being moved.

The Parker Motor Co., Ltd., has been incorporated with head office at Winnipeg, Man., and a capital of $10,000,000.

The Doble Motors Inc., San Francisco, is to manufacture about 500 cars a year. The company has been reorganized and recapitalized by Abner Doble, Jr., designer of the Doble-Detroit steam car. The local company is the only one which has complete rights to the Doble patents for a steam car.

The Kahn Mfg. Co., Milwaukee, manufacturer of spark plugs and ignition devices, has been made defendant in bankruptcy proceedings which claim liabilities of $32,000 and admit assets of $15,000.

The Lansing Bus Co. has been organized in Lansing, Mich., as state distributor, with a complete line of special bodies for all makes of truck chassis. Fred L. Waite, who is financially interested in the new company, will manage the business.

The Minneapolis Steel & Machinery Co. has moved its New York Offices to 2008 Woolworth building. The main export offices of the company will be located in the future at the factories at Minneapolis, where C. W. Hadden, manager of foreign sales, will make his headquarters.

The Duplex Storage Battery Co., Beaver Dam, Wis., is now operating on a 90 per cent time basis, against 50 per cent sixty days ago. The factory covers 3½ acres with 60,000 sq. ft. under roof.

J. S. Garlent has been named factory manager of the Auto Wheel and Gier Pressed Steel Units of the Motor Wheel Corp., at Lansing. Garlent joined the organization a year and a half ago, previous to which time he was factory superintendent for the King Motor Car Co. in Detroit.

L. A. Smith, formerly on the executive staff of the Maxwell Motor Co., has been made vice-president and director of sales of the American Motors Corp. of Plainfield, N. J., manufacturing the American Balanced Six.

The American Hammered Piston Ring Co. is shipping large quantities of its rings to the Pacific coast by way of the Panama Canal and shipments have been going ahead consistently to all of the large cities in the western states. C. F. Hockley, president of the company, has left for a tour of the coast to visit distributors responsible for the upward trend of sales.

The King Motor Car Co., Detroit, will shortly add a coupe to its line and expects to be able to make deliveries on Aug. 1. "We believe that a new coupe at this time with the public's preference turning towards closed jobs will find a good reception," A. Weber, president of the company says.

Rutenber Motors Corp. expects to be in full operation in its new plant at Marion, Ind., this fall. The Velie motors plant, formerly occupied by Rutenber is occupied almost entirely with experimental and laboratory work and it is understood that when production is organized for the fall a new design of power plant will be announced.

The Indiana Truck Corp., Marion, Ind., is going steadily on a curtailed schedule. Orders from Mexico, the central states, road builders and others are causing preparations for an increased production in June. Most of the new business is coming in from Chicago, Kansas and Texas and is a decided increase over April.

Winfield Barnes Co. assets will be offered at public sale by the receivers under permission granted by Judge Thompson in the United States district court at Philadelphia.

The Pilot Motor Car Co. has leased the building formerly occupied by the First National Bank, in Richmond, Ind., and will use it as a salesroom. The downtown agency will be in charge of Howard Steinkamp, retail dealer. Four or five counties adjacent to Wayne in Indiana and Ohio being under the jurisdiction of the sales office.

The Goshen Buggy Top Co. and four other creditors whose claims aggregate $44,110.37 have asked the circuit court at Goshen, Ind., for the appointment of a receiver for the Huffman Bros. Motor Co. of Elkhart, manufacturer of the Huffman car. The petition declares the company's liabilities are about $275,000 and its assets, $200,000.